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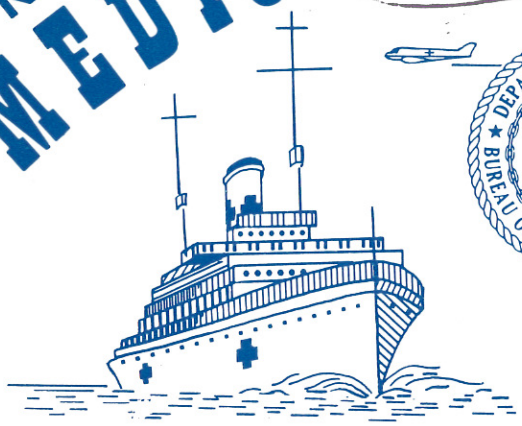
UNITED STATES NAVY MEDICAL NEWS LETTER



Vol. 53 May 1969 No. 5

CONTENTS

United States Navy
MEDICAL NEWS LETTER

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Policy

The U.S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article, in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

Change of Address

Please forward changes of address for the News Letter to Editor: Bureau of Medicine and Surgery, Department of the Navy, Washington, D.C. 20390 (Code 38), giving full name, rank, corps, old and new addresses, and zip code.

The issuance of this publication approved in accordance with NAVEXOS P–35.

ANNIVERSARY GREETINGS TO ALL NURSE CORPS OFFICERS

As your Surgeon General, I take great pleasure in extending to each of you warm personal greetings on the occasion of your sixty-first Anniversary.

For over six decades the members of your Corps have made notable and significant contributions to the medical care of the military man and his family. Whether it be on the seas off the coast of Vietnam or in our large Naval hospitals in the cosmopolitan cities of our country, I am confident that you will always reflect the highest standards of nursing practice.

The scope of your professional activities has not been limited to the practice of your profession in the Navy, but has reached out into the civilian communities wherever you have been assigned.

Your performance of duty has reflected laudable credit upon the Navy Nurse Corps and has been in keeping with the highest tradition of the Naval Service.
I thank you for your dedicated work and look forward to your continued support and assistance during our critical time of need.

Happy Anniversary!

G. M. DAVIS
Vice Admiral, MC, USN
Surgeon General

DISQUALIFYING CARDIOVASCULAR DISEASE IN NAVY AND MARINE CORPS RECRUITS

LCDR Arthur D. Hagan, MC, USN and CDR James N. Trone, MC, USN†,*
Milit Med 133(11): 896–899, November 1968.

The brief, and often hastily performed, screening-type examinations conducted at recruiting centers have long been a source of concern among all branches of the military service. Concern about physically unfit men being drafted into the Army was expressed not long ago by Congressman Schweiker in a letter to the Secretary of Defense. Representative Schweiker, a member of the House Armed Services Committee, reported in that correspondence that the government was wasting 1.5 million dollars annually by accepting physically unfit men for military duty. He also stated that a 1964 investigation by the Comptroller General revealed that approximately 3,250 enlisted personnel were separated from the services during fiscal year 1963 because of physical defects which should have been disclosed prior to being accepted on active duty.

The problem of pre-existing disqualifying cardiovascular defects among Navy and Marine Corps recruits was investigated. Data were retrieved from two sources: (1) the Naval Medical Data Services Center for fiscal years 1965 and 1966, and (2) analysis of records from the Naval Training Center, San Diego, for the calendar years 1965 through 1967.

The total number of both Navy and Marine Corps recruits discharged during fiscal years 1965 and 1966 because of cardiovascular disorders which existed prior to induction was 486. The cumulative time spent in service of these men amounted to 90 years, and the total pay was approximately $100,000. Figures obtained from each of the recruit training commands in San Diego revealed the training costs per recruit for the eight- or nine-week training period for fiscal years 1966 and 1967, exclusive of pay, to be approximately $600. Sgalitzer reported that each such medical discharge cost between $447 and $494, which did not include either training costs or medical expenses of examination, hospitalization, or treatment.

The Medical Data Services Center subdivided the 486 medically discharged recruits into the following diagnoses:

1.	Hypertension		252
2.	Varicose veins		55
3.	Non-rheumatic valvulitis		12
4.	Rheumatic fever		16
5.	Active rheumatic heart disease		17
6.	Inactive rheumatic heart disease		26
7.	Congenital heart disease		30
	a. Tetralogy of Fallot	3	
	b. Ventricular Septal Defect	6	
	c. Atrial Septal Defect	3	
	d. Unspecified	18	
8.	Arrhythmia		22
9.	Raynaud's disease		7
10.	Arteriosclerotic heart disease		2
11.	Heart block		1
12.	Unspecified disease of heart		46

During the three calendar years 1965–1967, a total of 408,481 recruits graduated from the Naval Training Center. During this same period 2,604 medical discharges were accomplished for existent-prior-to-enlistment (EPTE) disorders. This represents about two-thirds of one percent, which is significantly less than Sgalitzer reported. Approximately one-half of these 2,604 were discharged for orthopaedic or neuropsychiatric reasons, which compared favorably with Sgalitzer's study. The latter found an incidence of 5.6 percent with cardiovascular conditions, which again is very close to our findings of six percent (159 of 2,604). Usually, only a small portion of basic training had been completed prior to their discharge; however, virtually all these men were in the Navy in excess of 30 days, which allows them to qualify as veterans. With this status being achieved, and, regardless of determinations made by a Board of Medical Survey, a man may claim service aggravation of his condition, and possibly obtain a pension from the Veterans Administration.

The percentage rejected at the time of the original examination at the various induction centers is unknown; however, it must be emphasized that all recruits being discussed in this paper were at one time examined and found qualified. The Navy's Manual of the Medical Department outlines the causes for rejection of enlistment and induction into the Navy and Marine Corps. The standards set forth in this reference are very similar to those fol-

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Presented at the Annual Scientific Session of the American College of Cardiology in San Francisco, 1968.

lowed by the Army, which are outlined in Army Regulations 40–501.

When the Navy recruits first arrive at the Naval Training Center in San Diego, they are initially seen in "Receiving and Outfitting." If any question arises about a man's physical condition, further progress of his training is delayed until he has been examined at a "Medical Evaluation Unit" and disposition made. If additional evaluation, treatment, or consultation is necessary, he is transferred to the dispensary for admission. When indicated, he may be seen in consultation at the Naval Hospital. Once a disqualifying defect is established, a medical survey is written, authorized by Bureau of Medicine and Surgery Instruction 1910.2 E, stating the diagnosis, the fact that it existed prior to enlistment, and that it was not aggravated by the service. Ordinarily the man is then discharged and sent home without further studies or treatment with the recommendation that he seek the attention of his family physician.

Findings

During the three years 1965 through 1967 a total of 125,846 Marine recruits graduated from the Marine Corps Recruit Depot. A total of 2,237 (1.8 percent) were discharged because of EPTE medical reasons during this time. Records were unavailable to investigate these in detail.

At the Naval Training Center 408,481 recruits graduated during the same three-year period, but only 0.6 percent were lost due to EPTE diagnoses. Of the 2,604 medically surveyed, 159 had cardiovascular diagnoses. One hundred and ten of these 159 (70 percent) were classified as hypertensives, the latter identified as any recording exceeding 140 systolic or 90 diastolic. This group had an age range of 17 to 24 years, with an average of 19.5 years. Of 102 with satisfactory records, 82 were aware of having elevated blood pressure prior to induction, but only 43 admitted this history at the time of their original examination. Family history of hypertension was known to exist in 16 of the 102. Seven had been previously rejected for military service because of hypertension; in fact, one man on five separate occasions. The blood pressure ranged from 110 to 220 mm Hg systolic and 50 to 124 diastolic. Nine of the 102 had systolic pressures over 190 mm Hg, while three had normal systolic recordings of 140 or below. Forty of the 102 had normal diastolic pressures of 90 mm Hg or below; hence, a significant percentage probably did not actually have hypertension. Thirty-two were identified as being obese, without specific weights being given. Presumably, all recruits had a 70 mm photofluorogram performed; however, only 25 of the 102 cases had chest X-rays referenced in the medical surveys, and no abnormalities were reported. Of the 29 who had electrocardiograms performed, three were abnormal. Only eight of the 102 were referred for cardiac consultation. Of this entire group of hypertensives, five had systolic murmurs described, one of whom was seen by a consultant, without any specific diagnosis being ascribed to any of the murmurs. Neither lower extremity pulses nor bruits were mentioned in any of the cases. Few if any laboratory data were ever obtained in this group of hypertensives.

It is obvious that hypertension represented the major problem among these 159 cases; however, there were 44 others with a variety of cardiovascular diagnoses. While 80 percent of the hypertensives knew they had elevated blood pressure prior to enlistment, cognizance of their respective medical disorders was even higher in this group, namely 41 of the 44 (93 percent). Of these 41 men, 24 (58 percent) mentioned the presence of their condition on the original history sheet (Standard Form 89). With rheumatic heart disease and congenital heart disease accounting for the largest segments of this group, 25 percent and 30 percent respectively, the following diagnoses were represented:

1.	Rheumatic Heart Disease with valvular abnormalities		11
2.	Rheumatic Fever, recent history of		2
3.	Arrhythmias, acquired, recurrent		4
	a. Paroxysmal Atrial Tachycardia	2	
	b. Nodal Tachycardia	1	
	c. Atrial Fibrillation	1	
4.	Congenital Heart Disease		13
	a. Ventricular Septal Defect	3	
	b. Atrial Septal Defect	1	
	c. Subvalvular Aortic Stenosis	1	
	d. Bicuspid Aortic Valve	1	
	e. Coarctation of Aorta, postoperative	2	
	f. Anomalous Coronaries	1	
	g. Situs Inversus with either pulmonic stenosis or corrected transposition of the great vessels	1	
	h. Paroxysmal Atrial Tachycardia	1	
	i. Complete Heart Block	1	
	j. WPW Syndrome	1	
5.	Congenital Pectus Excavatum with impaired pulmonary function	2	
6.	Raynaud's Phenomena		5
7.	Varicosities of legs		3

8.	Venous Insufficiency of legs without varicosities	2
9.	Miscellaneous	2
	a. Encephalopathy	1
	b. Thrombosis, Right Auxillary Vein, recurrent	1

The eleven with rheumatic heart disease included the following:

A.	Aortic Stenosis	4
B.	Aortic Insufficiency	4
C.	Aortic Stenosis and Insufficiency	1
D.	Mitral Insufficiency	1
E.	Mitral Stenosis and Insufficiency	1

Seven of these eleven men recorded the history of their heart condition on the Standard Form 89 at the time of induction, but, in spite of this, were still qualified for enlistment.

The Manual of the Medical Department identifies "recent history of rheumatic fever" as any time within the previous two years. The two men included here were asymptomatic and had normal physical examinations.

Of the three cases with ventricular septal defects, one had had a cardiac catheterization confirming the diagnosis, another had previously undergone surgery for severe pectus excavatum, and the third had been rejected for enlistment by the Air Force.

Both of the coarctations of the aorta had been operated approximately two years before enlistment. One had an excellent surgical result, but was discharged because of symptoms of vasomotor instability. The other case still had hypertension and left ventricular hypertrophy.

One recruit, older than usual at 28 years of age, was discharged with the diagnosis of Ischemic Heart Disease secondary to an anomalous left coronary artery. This had been confirmed only four months earlier by arteriography.

The three arrhythmias listed under congenital heart disease were all well documented from birth or early childhood. The two men with severe pectus abnormalities were very similar in that both also had marked obstructive-type ventilatory defects, which were unresponsive to bronchodilators.

The case with encephalopathy was included with vascular diagnoses because of the history of brain surgery performed twice for hemangioma of the cerebellum, with mild residual left hemiparesis and ataxia.

Summary

The problem of pre-existent disqualifying cardiovascular disorders among Navy and Marine Corps recruits was discussed. During the three years from 1965 through 1967, a total of 408,481 Navy recruits were graduated in San Diego; and 2,604 (0.6 percent) had to be medically surveyed because of EPTE medical problems. Of this number, 159 (6 percent) had cardiovascular diagnoses. One hundred and ten (70 percent) were classified as hypertensives. Of this group, 40 percent were discharged with only systolic pressure elevations. Regardless of the specific diagnosis, investigation revealed that 80 to 90 percent of these men had knowledge of their condition before enlistment, and over half of them admitted their respective abnormality in the health record.

The total percentage of disqualifying medical conditions missed at the time of enlistment is not great. While the induction center screening-type examination has often been incriminated, it would appear that approximately half of the erroneous inductions could have been avoided had closer attention been paid to the man's recorded history. This responsibility rests, of course, with the local draft boards and induction centers.

(The references may be seen in the original article.)

VIRAL HEPATITIS ASSOCIATED WITH ILLICIT PARENTERAL USE OF DRUGS

William E. Dismukes, MD; Adolf W. Karchmer, MD; Ronald F. Johnson, MD; and William J. Dougherty, MD, JAMA 206(5): 1048–1052, Oct. 28, 1968.

Hepatitis surveillance case records of persons aged 15 to 29 years, with the dates of onset of disease during a 45-month period were cross-checked against state and municipal files of arrested drug-law violators. One hundred and eighty-three persons with hepatitis were known to use drugs parenterally and an additional 79 were suspected parenteral-drug users. Of these 262 persons with hepatitis associated with parenteral use of drugs, 92 percent were males. The 262 cases represent 16.6 percent of all cases of viral hepatitis in the 15- to 29-year-old age group in New Jersey. The data indicate that illicit parenteral use of drugs accounts in large part for the unusually high incidence of hepatitis among young adult males in New Jersey and contributes significantly to hepatitis morbidity.

Unusual age and sex characteristics have been observed in reported cases of viral hepatitis in New Jersey within the past five years, i.e., there was a high proportion of cases among males 15 to 29 years old. Recent reports from two areas of the state have demonstrated instances in which hepatitis was associated with illicit parenteral use of narcotics. Also, during the past ten years the great majority of persons arrested for drug violations in New Jersey were young adult males. These observations suggested a statewide association between hepatitis morbidity and drug abuse—an association so extensive that it has a major effect upon the observed age-sex distribution of reported cases of viral hepatitis. Accordingly, we undertook an investigation to evaluate this association.

Materials and Methods

In New Jersey, individual hepatitis surveillance case records are completed by physicians or public health officials on reported cases of viral hepatitis (during 1964 to 1966, such records were completed for 98 percent of all cases of hepatitis reported to the State Department of Health). A surveillance case record includes identifying information, descriptive clinical information, and epidemiologic data, particularly that relating to possible modes of acquisition of hepatitis. More specifically, each completed record states whether or not an individual admits to parenteral use of drugs. A person who denies having used drugs parenterally may be designated a user by a physician or public health worker because of acquired information or findings on physical examination.

Surveillance case records for 3,787 cases of viral hepatitis with dates of onset during a 45-month period, July 1963 through March 31, 1967, were analyzed for histories of contact, transfusion, illicit parenteral use of drugs, and medical inoculation (including blood tests, skin tests, vaccinations, dental work, and tattooing).

A state narcotic file, accumulated since 1952, lists alphabetically an estimated 15,000 drug violators, defined as follows: persons arrested, whether convicted or not, for a drug offense (including "narcotic drugs" or "depressant and stimulant drugs"); users of narcotic drugs who have registered, as required by law, following conviction; and persons suffering the effects of narcotics usage who are reported by physicians. (By definition, narcotic drugs are: opium, pethidine or coca leaves, or any compound manufacture, salt, derivative, or preparation of these; or marijuana. "Depressant or stimulant drugs" are any drugs which contain barbituric acid or its salt; amphetamine, or its salt, or any of its optical isomers, or their salts; or any substances designated as having potential for abuse because of their stimulant, depressant, or hallucinogenic effect on the central nervous system.) The file contains identifying information about each person, including full name, street address, city and county of residence, sex, and birth date or age at a given time.

A case-by-case cross-check of 1,583 surveillance case records was made with the state narcotic file; these 1,583 were all 15- to 29-year-old hepatitis patients among the 3,787 with onset of hepatitis in the period studied.

Based on the analysis of surveillance case records and the comparison of these records with the narcotic file, each 15- to 29-year-old hepatitis patient was grouped in one of the following categories: "known parenteral-drug user," if the patient ad-

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Table 1.—*Age Distribution of Reported Cases of Viral Hepatitis Attack Rate per 100,000 Population per Year**

Ages	New Jersey (1964–1966)	United States (1965)
0–4	3.3	6.9
5–9	15.3	32.4
10–14	22.4	30.8
15–19	45.2	30.9
20–24	54.4	37.1
25–29	25.9	26.7
30–30	19	15.5
40–49	13.2	9.8
50+	8.6	6.2

* Data from Morbidity and Mortality Weekly Report, Annual Supplements, 1964–1966.

Table 2.—*Hepatitis Cases * According to Age and Sex †*

Ages, Yr	Hepatitis Cases M		F		Total	
0–9	177		174		351	
10–14	214		173		387	
15–19	424		206		630	
20–24	419	**1,054**	190	**529**	609	**1,583**
25–29	211		133		344	
30–34	194		133		327	
35–39	164		127		291	
40+	449		371		820	
Unknown	14		14		28	
Total	2,266		1,521		3,787	

*Data from hepatitis surveillance case records.
†New Jersey, July 1963 to March 31, 1967.

mitted to parenteral use of drugs or was designated as such at the time the surveillance case record was completed; "suspected parenteral-drug user," if the individual denied the use of drugs on the surveillance case record but was identified in the narcotic file by matching name, age, sex, and address on the surveillance case record; or "nonuser of drugs," if neither of the previously mentioned criteria was satisfied.

Results

Hepatitis Patients: Age and Sex.—Age-specific attack rates of viral hepatitis for New Jersey and the United States are shown in Table 1. During a three-year period (1964 to 1966) in New Jersey, the highest age-specific attack rates were in the 15- to 19-year-old and the 20- to 24-year-old age groups. These rates (45.2 and 54.4 cases per 100,000 population, respectively) are about twice as high as those for patients in other age groups in New Jersey and are significantly higher than the corresponding rates for patients in the United States. The group aged 25 to 29 years had the third highest attack rate in New Jersey.

Considering the 3,787 persons with onsets of viral hepatitis during the 45-month period selected for study, it is apparent that in all age groups, cases occurred more frequently in males (Table 2). More striking, however, is the twofold predominance of males over females (1,054 to 529) among the 1,583 persons in the groups aged 15 to 19, 20 to 24, and 25 to 29 years.

Hepatitis Cases: Drug Use.—As shown in Table 3, of the 1,583 patients in the 15- to 29-year-old group, 183 or 11.6 percent were known parenteral-drug users. (Of these, 158 admitted to drug use, and the remaining 25 were designated as users.) In contrast, only six of the 2,204 hepatitis patients outside this age group were known users. Among the 183 known users in this age group the ratio of males to females approached 10:1; this excess of males was seen in each of the component age groups, 15 to 19, 20 to 24, and 25 to 29 years.

Table 3 also shows that in the 15- to 29-year-old group an additional 79 persons, although not admitting to parenteral drug use on the hepatitis case record, were suspected of using drugs parenterally based on identification in the state narcotic file. Furthermore, the sex distribution of these 79 (74 were males) was similar to that noted among the 183 known users. The addition of these 79 suspected users to the 183 known users results in a total of 262 patients with hepatitis (16.6 percent of cases in the 15- to 29-year age group) associated with parenteral drug use.

Table 3.—*Hepatitis Patients Aged 15 to 29, According to Sex and Category of Drug Use **

	Hepatitis Cases			Cases in Known Parenteral-Drug Users			Cases in Suspected Parenteral-Drug Users			Total Cases Associated With Parenteral Drug Use		
Ages	M	F	Total	M	F	Total	M	F	Total	M	F	Total
15-19	424	206	630	65	10	75	33	1	34	98	11	109
20-24	419	190	609	85	7	92	34	2	36	119	9	128
25-29	211	133	344	16	0	16	7	2	9	23	2	25
Total	1,054	529	1,583	166	17	183	74	5	79	240	22	262

* New Jersey, July 1963 to March 31, 1967.

Table 4.—*Hepatitis Cases by Age Group and Possible Modes of Acquisition**

Groups	Hepatitis Cases†	History of Transfusion of Blood or Blood Products		History of Medical Inoculation		History of Contact With Previous Case: Household		Outside	House-hold
		No.	%	No.	%	No.	%	No.	%
Cases, age 1-14	738	10	5.7	218	29.5	67	9.1	107	14.5
Cases, age 15-29	1,583	37	2.3	620	39.2	65	4.1	224	14.2
"Known parenteral-drug-users"	183	0	0	56	30.6	3	1.6	39	21.3
"Suspected parenteral-drug users"	79	0	0	30	38	2	2.5	15	19
"Nonusers of drugs"	1,321	37	2.8	534	40.4	60	4.5	170	12.9
Cases, age $\geq$ 30	1,438	244	17	635	44.2	35	2.4	50	3.5

*New Jersey, July 1963 to March 31, 1967.
†Does not include 28 cases, age unknown.

Hepatitis Cases: Other Possible Modes of Acquisition.—The frequencies of other possible modes of acquisition of hepatitis by persons aged 1 to 14, 15 to 29, and 30 years and older are shown in Table 4. Several differences are readily apparent among persons in the three age groups. First, the percentage of cases with history of transfusion of blood or blood products or both within six months prior to onset of illness was much less in the 1 to 14 and 15 to 29 age groups (5.7 percent and 2.3 percent) than in the group 30 years or older (17 percent). Furthermore, in the group aged 15 to 29, not one known or suspected drug user had a history of blood transfusion.

Second, although the percentage of persons with a history of medical inoculation increased with age, within the group aged 15 to 29 the percentage with this history was significantly lower for known users than for the age group as a whole and the other two categories within the age group.

Third, in all of the age groups, a history of household contact was less frequently reported than contact outside the household. The difference was greatest in the 15- to 29-year-old group. Here, known and suspected users had less frequent histories of household contact (1.6 percent and 2.5 percent, respectively) than the nonusers of drugs (4.5 percent), but they had more frequent histories of contact outside the household than nonusers (21.3 percent and 19 percent, compared with 12.9 percent).

Results of Study in Four Counties

A study similar to the one described here for the entire state was carried out in four New Jersey counties. The purpose of this smaller study was to evaluate the completeness of the state narcotic file by determining how many additional cases of hepatitis associated with illicit drug use could be detected in the four counties.

Hepatitis surveillance case records of patients aged 15 to 29 years whose county of residence was Camden, Hudson, Essex, or Mercer were cross-checked with the municipal narcotic files of Camden (Camden County), Jersey City (Hudson), Newark (Essex), and Trenton (Mercer). Although hepatitis cases are reported by county of residence, narcotic files are not maintained according to counties. Hence, surveillance case records were compared with the narcotics file of the city representing the major population component of the county in question. These narcotic files resemble in general the file kept by the state. Hepatitis cases were categorized in a manner identical to that used in the statewide study.

The results of the case-by-case cross-check of surveillance case records and the four municipal narcotic files are summarized in Table 5. This cross-check identified 48 parenteral-drug users, predominantly male, not previously identified from the hepatitis case records or the state file. Essex County alone accounted for 31, while Camden County had only one. The percentage of hepatitis cases associated with parenteral drug use, identified by all means—surveillance case records, the state narcotic file, and the municipal narcotic file—ranged from 1.5 percent in Camden County to 36 percent in Essex County.

Table 5.—*Hepatitis Cases, Age Group 15 to 29 in Four New Jersey Counties According to Category of Drug Use**

County	Hepatitis Cases	Cases in Known Parenteral-Drug Users	Cases in Suscepted Parenteral-Drug Users (State File)	Cases in Suspected Parenteral-Drug Users (Municipal File)†	Total Cases Associated With Parenteral Drug Use	Cases Associated With Parenteral Drug Use (%)
Camden	68	0	0	1	1	1.5
Essex	408	78	38	31	147	36
Hudson	132	22	5	14	40	30.3
Mercer	69	3	4	3	10	14.5

*July 1963 to March 31, 1967.
† Cases not admitting parenteral use of drugs and not identified in state file but identified in municipal file.

Comment

The disproportionate distribution of reported cases of viral hepatitis among young adult males in New Jersey bears a striking similarity to the age and sex distribution of persons who are arrested for narcotics violations. The New Jersey Legislative Drug Study Commission reported that during the period 1956 to 1965, eight times as many males as females were arrested for narcotics violations. Furthermore, about 86 percent of all arrested narcotics violators were between the ages of 18 and 34, and approximately 70 percent were less than 30 years of age.

The kinds of drugs and methods of drug use also bear upon a possible relationship with hepatitis. Among those arrested annually for any narcotics violation, the percentage arrested for use of narcotics ranged from 27 percent to 47 percent. Heroin was the drug most often used. The ratio of heroin users to marijuana users apprehended during the ten-year period approaches 14:1, which indicates the relative frequency with which the parenteral route is used by those arrested.

The characteristics of those arrested for offenses involving dangerous drugs, i.e., depressants and stimulants, were similar to those of narcotic-drug violators; arrests of males far exceeded arrests of females, and the majority of those arrested were young adults. In 1964 and 1965, approximately 85 percent of these arrests were for possession and use of drugs.

There is evidence that unhygienic and extensive sharing of injection equipment among users of narcotics or other habituating drugs facilitates the transmission of hepatitis. Hence, the similarity between the observed age-sex patterns of hepatitis patients and arrested narcotics and dangerous-drug offenders, as well as the frequency with which the parenteral route is used by these offenders, strongly suggest that illicit parenteral use of drugs accounts in large part for the unusual proportion of hepatitis cases in young-adult males in New Jersey. In fact, 262, or 16.6 percent of hepatitis cases in patients in the 15- to 29-year-old age group were shown to be associated with parenteral drug abuse. Of these, 92 percent occurred in males.

Further support of the relationship between illicit use of drugs and viral hepatitis is provided by the greater than expected number of hepatitis patients who, although not admitting to parenteral use of drugs, were identified as drug violators in the state narcotic file. Several aspects of the file should be noted: it includes offenders arrested during a 15-year period, 1952 to 1967; its organization does not permit easy subdivision according to date of entry into the file, type of drug used, or age and other characteristics of the offender; while specifying the nature of the drug violation, it does not differentiate between violators who use drugs parenterally and those who do not; and it does not enable the establishment of temporal relationship between the violation and the occurrence of hepatitis. Nevertheless, the association of hepatitis cases with drug offenses is striking. By chance alone, approximately 17 hepatitis patients aged 15 to 29 would be expected to be identified in the file as drug violators. (The following formula was used for this determination:

$$\frac{\text{Persons in state narcotics file}}{\text{Estimated 1966 New Jersey population aged 15-29}} \times \text{No. of hepatitis patients aged 15-29 not admitting drug use.} \approx \text{Expected number}$$

$$\frac{\approx 15{,}000}{1{,}238{,}818} \times 1{,}400 \approx 17)$$

Actually, 79 were identified. It should be pointed out that the approximation of 17 patients may in itself be high, both because the 15,000 listed in the narcotics file are persons of all ages whose names were added to the file over an extended period of time, and because the denominator (1,238,818) does not include all persons who were 15 to 29 years old during the 15-year period.

In considering individual cases of hepatitis, it is not possible to determine with certainty that illicit

parenteral use of drugs was the means by which hepatitis was transmitted. Users of narcotics and dangerous drugs, by the nature of their sometimes unhygienic and intimate communal living habits, are exposed to persons with hepatitis. As a result of these exposures, some of the users may acquire the disease transmitted by the fecal-oral route. In most instances, however, it is more likely that the hepatitis is directly related to frequent and indiscriminate sharing of contaminated injection equipment, and that, etiologically, the mode of transmission is more likely parenteral than fecal-oral. Other specific means of parenteral transmission appear unlikely. None of the 262 drug users with hepatitis had blood transfusions within six months prior to onset of illness, and the percent of known and suspected users who had a history of medical inoculation was less than that for the nonusers of drugs.

Although as many as 16.6 percent of hepatitis patients in the 15- to 29-year age group was found to be known or suspected parenteral-drug users, this probably represents a minimum estimate of the extent of the relationship. When additional hepatitis cases associated with parenteral use of drugs were looked for at a county level, such cases were detected in each of the four counties studied. In Hudson and Essex counties, both adjacent to New York city, the proportion of hepatitis cases associated with parenteral drug use, considering all sources, was 30.3 percent and 36 percent, respectively. The additional cases detected in three counties point out the possible extent of the relationship.

Another indication that a still more extensive relationship exists in the reluctance of physicians to report persons with narcotics-related illnesses. An attitude survey conducted by the New Jersey State Health Department in 1965 indicated that only 63 percent of doctors polled in the survey were willing to report narcotics offenders to police or health authorities. This reluctance, when considered with the cryptic and devious behavior of persons using drugs illicitly, allows many drug violators to remain unknown to the authorities. Thus, because of the relative anonymity of many drug offenders, the number of hepatitis cases associated with illicit parenteral use of drugs is likely to be far greater than is now recognized.

The association of viral hepatitis and parenteral drug abuse in New Jersey emphasizes a major medical complication which may result from the illicit use of drugs. Although this complication of drug abuse is manifested in the individual user, the problems secondary to it extend to the general public. There is evidence that an appreciable risk of transmitting hepatitis exists when blood for transfusion purposes is obtained from poorly screened skid-row donors. The frequent sale of blood by the drug user in an attempt to finance his habit creates a public health hazard. The fact that an association with parenteral drug abuse can be identified in at least 16.6 percent of all viral hepatitis cases in the 15- to 29-year-old group in New Jersey dramatizes this hazard.

Assistance was provided by Lt George R. Kell, Chief, New Jersey State Police Narcotics Squad, and his staff, and the narcotics squads of Camden, Jersey City, Newark, and Trenton, who made their records available and helped interpret them; and by Margaret Marcinkus, RN, Howard Rosenfeld, VMD, and Paul Marzinsky, Division of Preventable Diseases, New Jersey State Department of Health. Joyce Hughes and Dianna Raskin helped analyze and compare case records.

(The references may be seen in the original article.)

TETANUS PROPHYLAXIS

Howard E. Snyder, MD, FACS, Winfield, Kansas, Surg Gynec Obstet 127(2): 351–352, August 1968. "By permission of Surgery, Gynecology & Obstetrics."

Tremendous improvement in tetanus prophylaxis has occurred in this country since the introduction of tetanus toxoid for active immunization. Cauterization of wounds from nails with phenol has been replaced by careful débridement. The importance of meticulous surgical care of all wounds, with delayed closure of badly contaminated ones, has been recognized. The use of manure poultices and similar home remedies has disappeared. Better obstetric care and aseptic division and ligation of

the umbilical cord have almost elimated postpartum and neonatal tetanus. Most of our children now receive basic active immunization for tetanus prior to attaining school age. Tetanus immune globulin is now replacing heterologous antitoxin, and, therefore, the serious morbidity and mortality from reactions to horse serum can be avoided. However, not all of the problems of tetanus prophylaxis have been solved. In this country, tetanus continues to occur and in many developing countries the death rate from tetanus is higher than from any other infectious disease.

Tetanus immune globulin—homologous antitoxin is now available in the United States in adequate supply. Virtually, no reactions have been encountered after its use. Research with animals and early clinical use indicate that it is much more effective in securing a protective antitoxin level than the heterologous antitoxins of equine and bovine origin. Furthermore, the protective level lasts longer than it does with heterologous antitoxin. When nonimmunized persons with tetanus-prone wounds seek medical care, tetanus immune globulin should be given intramuscularly, never intravenously. At the same time, active immunization with aluminum phosphate adsorbed or alum-precipitated tetanus toxoid should be initiated. The toxoid is given with a separate syringe and needle in the other arm. Persons receiving such treatment should be emphatically advised to have a second dose of the toxoid within one month and a third, within six to twelve months.

Active immunization with tetanus toxoid is desirable, for all patients who seek medical care for wounds, but this is not enough. A crash program for universal active immunization against tetanus is in order. The value of previous active immunization with tetanus toxoid was definitely established by our World War II experience, during which only 12 instances of tetanus occurred in more than 2,500,000 injuries. Of these twelve patients, only six had had toxoid injections and four of these had had basic immunization in addition to an emergency booster dose. It has recently been shown that those actively immunized during World War II, but having since received no booster shots, will, with few exceptions, show a prompt and adequate recall of serum antitoxin when given a booster dose of toxoid. Most of the children born in the United States in the last decade have received tetanus toxoid along with diphtheria antitoxin and pertussis vaccine prior to attaining school age. However, there still remain millions of persons in the United States who have not been actively immunized.

The efforts of the American College of Surgeons, the American Medical Association, and the U.S. Public Health Service to have all persons actively immunized against tetanus have made only small inroads on the size of this unprotected group. Tetanus is bound to develop in some persons in this group if they do not seek medical or surgical attention for so-called minor wounds. Tetanus in many of those in this group may be expected to develop in the event of a nuclear holocaust or any mass disaster in which meticulous débridement of tetanus-prone wounds and passive immunization for persons not actively immunized are not accomplished.

Much can be done to improve this situation. All physicians must be alerted to the need for universal immunization and encouraged to seize every opportunity to initiate immunization with toxoid. This applies not only to patients with wounds but also to all others. All physicians in the United States should be familiar with the recommendations of the Committee on Trauma of the American College of Surgeons and with the "Guide lines for the Medical Profession Regarding the Prevention of Tetanus," voted on by the International Conference on Tetanus held in Bern, Switzerland, in 1966.

Persons more than 65 years of age could be immunized if all who are covered by Medicare were required to have basic immunization. The same requirement might be extended to recipients of Medicaid and to all others under programs in which there is federal participation in health care. Blue Cross-Blue Shield and other health, accident, and life insurance companies might offer inducement to their insured to be actively immunized against tetanus. Immunization of all children in the first year of life should be universally accomplished. Medicare and insurance cards could well record data on tetanus immunization and allergies, as well as other pertinent medical data, thus avoiding the necessity of another Emergency Medical Identification Card. Industrial and farm organizations could also request or require employees and members to have basic tetanus immunization.

Another problem which is receiving much attention in the United States and elsewhere is the development of a better toxoid or agent for active tetanus immunization. Currently available tetanus toxoids have been shown to vary considerably in their antigenicity. Many persons who receive one dose of toxoid do not return for the second and third injections, and, hence, not enough basic active

immunity may have developed for them to be adequately protected when given a booster dose for a wound. This may apply only to those receiving one dose of fluid toxoid or perhaps one of the weaker alum toxoids. The antigenicity of a tetanus toxoid depends not only upon the Lf units of toxoid, but also upon the quantity and character of the aluminum salt or adjuvant. The ideal toxoid or agent sought is one which given in one dose, will provide lasting immunity and will produce such protection rapidly enough to eliminate the need for simultaneous passive immunization in persons with wounds in which tetanus may develop. A one dose toxoid providing good basic immunization and lasting indefinitely may be developed soon. An agent to produce active immunity rapidly enough in order to prevent tetanus when given at the time of wounding will take longer to develop.

ALPORT'S SYNDROME: A REVIEW

I. Kaufman Arenberg, MD, Univ Mich Med Cent J 33(6):278–285, Nov-Dec 1967.

Alport's syndrome is characterized as hereditary nephropathy and bilateral neurosensory hearing deficit. Rarely, lens or other ocular abnormalities are associated with this entity. The disease affects males more severely than females. "Sex influenced lethality" is evident and males usually die before the third decade without progeny. Females can pursue a normal life, although they are predisposed to hypertension and edema during pregnancy. Cassady feels that this entity actually accounts for a good portion of idiopathic childhood nephritis and idiopathic childhood neurosensory hearing loss. At present no laboratory tests fully characterize Alport's syndrome. The diagnosis is suggested by a positive family history, urine sediment abnormalities or renal dysfunction, and audiometric evidence of neurosensory hearing loss. Treatment is supportive and individualized to cope with the specific problems inherent in a given case. Patients die of chronic renal failure. The etiology of this genetically conferred diathesis is unknown, but it is thought to be an enzyme abnormality resulting in toxic metabolic by-products.

General Historical Background

Descriptions of hereditary nephropathy date from 1875 when Dickenson presented a family (three generations) in which 11 of 16 members were affected with a benign type of albuminuria and an anemia which probably went "back to the War of Roses." He concluded that the disease "cleaves less to race than tubercle, cancer, stone, but yet the family proclivity declares itself unmistakably." Seven of these 11 affected individuals were females. Tyson in 1881 presented a family (three generations) in which 11 of 14 members were affected with hereditary Bright's disease. In 1887 Kidd described a family where males were more severely affected than females. Benson told of a family characterized by marked albuminuria, edema, and pale, enlarged kidneys at autopsy; but no heredofamilial basis was demonstrated. Pel's family had a chronic interstitial type of nephritis in which males and females were equally affected. Atlee registered 3 sisters with recurrent hematuria without a positive family history; however, it was reported that the father died in uremia of unknown etiology. Aitken reported a family of three generations in which 10 of 18 individuals were affected with sediment abnormalities or gross hematuria. The onset of the abnormalities usually occurred before the age of two. He was the first to report the unusual relationship of certain foods to attacks of hematuria.

Ferguson made a study of a family in which both parents (an 87-year-old man and a 78-year-old woman) were found to have persistent, nonlethal albuminuria. The mother was most severely affected. Five other females and 3 other males were also afflicted with various degrees of albuminuria, but none died of renal disease. A brother and sister who had chronic interstitial nephritis with albuminuria were investigated by Barber. Both also had stunted growth and possible "infantilism," without mental retardation. Eason tabulated the early literature and recorded the pedigrees of Hurst, Pel, Dickenson, and Kidd. He also discussed 2 brothers who developed acute glomerulotubular nephritis within a short period of time. He concentrated his discussion on the acquired and hereditary aspects of the disease.

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Guthrie began a study of an Anglo-Saxon family, to which later additions were made by several other investigators and finally by Alport himself. Guthrie characterized this familial affliction as "paroxysmal exacerbations of hematuria, accompanied by pyrexia, malaise, headache, vomiting, pain in the back and limbs and often attributed to catching cold." He treated those affected with "substantia supra renalis," 1¼ grains three to four times a day, and was able to "decrease the hemorrhage." It was presumed that this was a crude extract of the adrenal gland and contained active glucocorticoids. However, since Williamson reported that the use of cortisone in his treatment was to no avail, it was probable that the extract was given when the acute exacerbation was undergoing remission.

Kendall stated that in this particular family an attack of gross hematuria could be precipitated by increased exercise, stress, extremes of heat or cold, and most interestingly, by eating certain foods. Hurst added 5 more cases to Guthrie's original family and was the first to mark 3 affected members on the pedigree as being "deaf." However, no statement of the significance of the deafness was made until Alport's report in 1927. As a result of his observation of the association of deafness with nephropathy, this hereditary disease complex is now recognized as "Alport's syndrome." He further observed that "males are deaf with nephritis and die young; females are deaf with hematuria and can live to normal age."

Except for Rinkoff's report of 3 brothers without a positive family history for Alport's syndrome, little attention was paid to Alport's observations until Perkoff's study. He studied a large Mormon family in Utah, in which the affected people had pyuria in addition to the classic clinical manifestations of the disease (hematuria, proteinuria, and neurosensory hearing loss). He recognized that the pathologic changes in the kidneys increased with age and were markedly variable. Early in the course of the disease, biopsy revealed minor nonspecific changes such as erythrocytes in the tubules, or hyalinized glomeruli with tiny foci of lipid-filled foam cells were found in the interstitium between the tubules at the corticomedullary junction of the kidneys. In cases where the disease had progressed, the kidneys were small, and diffuse linear lipid streaks were seen on gross sagittal section at necropsy. Microscopically, renal changes resembled interstitial pyelonephritis and/or glomerulonephritis.

In the 1950's, Sohar's study generated renewed interest. He described a family with Alport's syndrome in which, in addition to the nephropathy and deafness, 3 males had spherophakia and/or posterior cortical cataracts. Since this report, many new cases of Alport's syndrome have appeared in the literature. Yet, the etiology remains obscure. Wallace reported 3 sibs who died due to chronic glomerulonephritis and who had no evidence of sensorineural hearing loss. This family was similar to the one reported by Eason and Rinkoff, having no positive genetic history. The surviving members of Wallace's family all had an abnormal nonspecific aminoaciduria.

Recent contributions have sought to elucidate the basic disease process by using sophisticated laboratory techniques. Hobolth, who studied 2 families with Alport's syndrome (in one of these, no member had any hearing loss), did Ouchterlony gel diffusion, Boyden hemagglutination, Donnelly complement fixation, and immunoelectrophoresis in the family without the deafness. Since this was not a classical Alport's family (no deafness), the validity of utilizing this information in characterizing the syndrome is questionable. Ohlsson found that there were abnormal urinary amino acids in 2 of 3 affected members with nephropathy, deafness, and severe myopia, but no serum amino acid correlation was obtained. He reported a normal karyotype in these members. In this study there were 12 other members of the family who were affected with albuminuria and/or hematuria without deafness or eye abnormalities.

A recent study by Cassady et al. of 6 families comprising 476 members utilized the following operational definitions in determining whether an individual was affected: (1) renal abnormality—greater than 3 red blood cells per high power field and/or 5 white blood cells per high power field, or more obvious renal dysfunction; (2) hearing—audiometric deficit of 20 decibels, or a greater loss at 4,000 cps or more; (3) eye—myopia, greater than −2 diopters. In addition, Cassady noted severe refractory otitis media associated with perforation in about one third of the patients with hearing loss, without alterations in the total serum protein, alpha one globulin, cholesterol, or uric acid. While creatinine and blood urea nitrogen were poor diagnostic indicators, urine concentration tests had some value. The urine revealed increased red blood cells in affected males and increased white blood cells in affected females. They utilized the polystyrene latex colloidal agglutination technique of Kramer et al. Of 92 affected patients tested, none were found to

show antihuman kidney factors. There was a statistically significant decrease in serum alpha lipoprotein.

Whalen et al, reported a case of hereditary nephritis and deafness in which the patient had pathologic findings consistent with glomerulonephritis (foam cells in the interstitium of the renal parenchyma). However, after study of multiple consecutive necropsy cases of chronic pyelonephritis and glomerulotubular nephritis and several other renal diseases in which foam cells were occasionally found they were able to conclude that the foam cell itself was not pathognomonic for Alport's syndrome.

Krickstein et al. showed that the lesions of the renal parenchyma in hereditary nephritis with concomitant nerve deafness were a definite pathologic entity and not glomerulonephritis, pyelonephritis, or interstitial nephritis superimposed. The changes they found were not consistent with any single diagnosis. Again foam cells were not pathognomonic, but they concluded that no other single renal disease had foam cells with the same consistency, quantity, and distribution. By studying biopsy, necropsy, and nephrectomy material in 13 unrelated but affected families, Krickstein's group was able to present an excellent over-all view of the pathology present at various stages. Four of 11 necropsy cases showed prominent yellow linear streaks which microscopically were composed of rows of lipid-filled foam cells. Microscopically, there were glomerular changes consistent with glomerulonephritis, but not all glomeruli were involved. Signs of pyelonephritis were present, but malformation of medulla and pelvis, presence of polymorphonuclear leukocytes, and "thyroidization" of tubules were not prominent findings. There was marked cortical tubular atrophy alternating with discrete areas of tubular regeneration, dilatation, and hypertrophy. In addition, protein-like tubular casts were a consistent finding, as were nephrocalcinosis and generally interstitial foam cells. Extensive diffuse fibrosis and infiltration of lymphocytes and plasma cells were found in cortical stroma. The foam cells had a characteristic distribution: lower cortex, corticomedullary junction, and tubules. The cytoplasm of the foam cells contained neutral fat, phospholipid, and cholesterol, but not mucopolysaccharide. They concluded that the foam cells were derived from tubular epithelium which had undergone degeneration, rather than interstitial macrophages, as had been previously thought.

Krickstein et al. felt that the foam cells developed secondarily and in a later stage, since earliest changes noted in renal biopsy material showed only red blood cell casts in tubular lumens. These casts were first seen several years after birth. Then focal interstitial fibrosis, chronic inflammation around tubules, and some tubular atrophy occurred. Following this, the tubular epithelial cells degenerated with subsequent accumulation of lipid into the cytoplasm. Then focal glomerulonephritis, pyelonephritis, and interstitial nephritis changed further. Progressively, the foam cells disappeared. The microscopic findings reflected the stage of the disease. However, more correlative work between the clinical and pathologic status should be undertaken.

The acute soft tissue calcifications and associated inflammation of a patient with Alport's syndrome who received chronic hemodialysis therapy will be reported by Thompson.

Hereditary Aspects

The mode of inheritance of this syndrome is controversial. Perkoff and Stephens believed the transmission in the Mormon kindred (Utah) to be dominant, partial sex-linked, although this kind of inheritance in man is not completely accepted. Graham, on the other hand, having reanalyzed the Utah kindred and reviewed several other pedigrees, concluded that the mode of inheritance was a sex-influenced, autosomal, dominant trait, more severe in males. He observed that there was a statistically significant deficiency of males (from affected parents of both sexes) over the entire Utah kindred. He noted an abnormal sex ratio, for which was postulated an early loss of heterozygous males in intrauterine life. Graham felt that partial sex linkage was "mistakenly proposed" because of the pleiotropism, incomplete penetrance, and variable sex expression of the "mutant gene."

In analyzing other pedigrees, Graham observed that it was possible for normal-appearing persons, or those showing only deafness, to transmit kidney disease. Also, male to male transmission has been reported. In addition to excess males (abnormal sex ratio), Graham also noted an excess of affected children. He decided that the hearing loss and renal lesions were manifestations of the same pleiotropic gene and not coincident and independent double heterozygosity.

Perkoff's group took issue with Graham's approach, methods of selection, and assumptions. They reiterated the conclusion that their data fit best with the findings expected of a sex-linked dominant trait with a few instances of crossing over. Graham humbly answered Perkoff's letter to the editor and defended his methods of selection and assumptions

on genetic and environmental basis. Both disputants decided to let future studies bear out the correctness of their conclusions.

Cohen disagreed with these two suggested modes of inheritance, and asserted that this syndrome, in these unrelated families, was not inherited as a partially sex-linked dominant trait or as an autosomal dominant trait giving classical Mendelian segregation ratios. He gave evidence from experimental organisms and a statistical analysis in support of the Shaw and Glover hypothesis.

Shaw and Glover proposed that the abnormal segregation ratios observed among the progeny of heterozygous fathers and mothers in their kindred and previously unrecognized in the Utah kindred resulted from nonrandom chromosome segregation at the first meiotic division of gametogenesis. This occurred with preferential segregation and chromosomal associations between the gene-bearing autosome and the X chromosome, a genetic phenomenon hitherto unreported in man. This hypothesis eliminated the earlier concept of partial sex linkage and autosomal dominance. They further stated that the syndrome seemed to occur in individuals heterozygous for some kind of dominant gene which was not completely penetrant. Some heterozygous individuals (males) produced affected offspring, but did not themselves manifest the condition. (A person was heterozygous if he himself was affected or produced affected children.) Shaw and Glover concluded that Alport's syndrome could be due to abnormal genes which showed nonrandom dysjunction in the female (where the chromosome bearing the mutant gene went to the oöcyte instead of the polar body more than 50 percent of the time, and preferential segregation occurred with the X chromosome in the males during spermatogenesis). The concept of sex-linked lethality was attributed to Sohar.

Associated Hearing Loss

Hurst was the first to observe the deafness in 3 patients with nephropathy, but he made no statement about its significance or relation of the deafness to the nephropathy. It remained for Alport, working with the same family, to recognize this association when he reported that 11 of 14 affected people were hard of hearing.

Perkoff studied a family in which 50 members had renal involvement and only 15 had a hearing loss. He suggested, therefore, the use of the audiogram to aid in the diagnosis of incomplete penetrance, or the "carrier state." Several others reported similar associated hearing loss and nephropathy but failed to quantitate it. It was evident from the summary by Johnson that the auditory loss occurred about one third of the time (34.6 percent). A wide range of the familial expression and penetrance of the hearing deficit has been recorded: from a low of 0 percent and 10 percent to a high of 87.5 percent and 100 percent.

"Trough-shaped" and "descending" types of audiometric curves have been reported. Dubach described trough-shaped audiometric curves on two males with an average loss of 50 decibels within the speech range, without a loss at greater than 4,000 cps. He later reported complete loss of hearing in the terminal phase. Over a two year period, Klotz was able to follow the progression from a trough-shaped curve to a descending curve in a 15-year-old boy.

One of the 2 families reported by Hobolth as having Alport's syndrome showed 8 of 22 members with renal involvement but *none* of these 22 had a hearing loss. The other family did have 2 members with associated defective hearing.

In the family studied by Ohlsson the 3 afflicted individuals had a hearing loss and a severe degree of myopia. Histologic sections failed to give an explanation for the hearing loss. Dubach reported that "Professor G. Nager (Zurich) found an atrophy of the ganglion spiral at the base of the acoustic nerve by dissections of the petrous bone."

Gregg followed the initial progression and final stationary phase of the neurosensory hearing loss in 1 male for several years. Though he made no mention of any family history of kidney or inner ear disease, he concluded that "the hearing loss must have been either of congenital origin or due to some toxic effect which was unrecognized during childhood." Unfortunately, this male died without giving forth progeny. In view of the negative family history, it will never be known if this was: (1) Alport's syndrome, and the penetrance of the rest of the family was phenotypically absent; (2) a true mutation; or (3) an unusual combination of rare circumstances— mild acute glomerulonephritis, otonephrotoxic exposure, and unrecognized blunt trauma to the eyes. Gregg's article contained one photomicrograph of this patient's organ of Corti which showed evidence of degeneration of the striae vascularis and hair cells, especially in the basal coil, and absence of the tectorial membrane. The spiral ganglion cells did not show apparent evidence of degeneration. The basilar membrane, Reissner's membrane, and other structures of the cochlea and vestibular labyrinth appeared normal.

Graham in analyzing the pedigree of six earlier reports, noted that deafness had been more common among affected males (29 of 51) than females (7 of 39). In evaluating the pedigree reported by Perkoff, Graham noted that 19 of 20 patients that were hard of hearing were males. He concluded that the renal lesion and hearing loss were manifestations of the same pleiotropic gene. (People who were only deaf transmitted renal lesions and vice versa.)

Cassady utilized the audiogram for an operational definition of "deafness." He defined this as a loss greater than 20 decibels or a loss greater at 4,000 cps. He found that 55 percent of affected males had a hearing loss as compared to only 39 percent of affected females. In addition, he picked up a large percentage of "possibly affected members of the family" who were also hard of hearing: 60 percent males, 43 percent females.

Johnson localized the lesion audiometrically to the cochlea: type II von Békésy tracings and short increment sensitivity index (SISI) greater than 50 percent. He ruled out retrocochlear involvement with tonal decay studies. He further stated that both brothers showed no intolerance to loud sounds.

Arenberg reported a family in which 2 of the 4 affected persons had a mixed hearing loss on one side and a sensorineural hearing loss on the opposite side, with a history of old, difficult to treat, perforated ear drums unilaterally. This is consistent with the findings of Cassady and Krickstein; however, no previous emphasis had been made of the occasional conductive component to the hearing loss.

Fujita and Hayden reported on 3 cases of temporal bone histopathology in which there was no significant sensory cell loss or any significant pathology to account for the hearing loss. Another patient had an unusual infiltrate in some mastoid air cells.

Arenberg et al. reported that the nerve degeneration pattern from the organ of Corti was essentially normal and there was an unaccounted for discrepancy between the neural loss and the audiometry. They concluded that the hearing loss found audiometrically was probably due to a metabolic dysfunction of the sensory cells rather than a complete sensory cell loss. The possible contributions of severe tinnitus, an unusual histologic infiltrate, and chronic hemodialysis were discussed. They also reviewed the known inner ear pathology and summarized the quantitative audiometric findings.

Associated Ocular Abnormalities

Aitken was the first to mention having examined the eyes of 10 patients with hereditary nephropathy. He noted that of the 5 examined funduscopically, all were normal. The first significant eye abnormalities were recorded by Sohar. He investigated an Iraqi-Jewish family, which included 4 affected brothers under 18 years of age. They all had renal involvement and some degree of deafness. In addition, 1 had spherophakia, 1 congenital posterior cortical cataracts, 1 had both, and 1 had neither. Spherophakia, as described by Sohar was a malformation probably caused by the sudden developmental arrest of the lens. The arrest was a result of aplasia of Zinn's zonules; fibers were weakened and unable to exert the expected pull on the periphery of the lens. Consequently, the lens kept its fetal round form. This spherophakia was familial and rare, never having been previously reported in Alport's syndrome. There was a positive family history since 2 uncles, 24 and 22 years of age, died from the same affliction; the mother was also affected.

Reyersbach observed "4 congenital abnormalities in one family," but did not provide any further information. One member of this family was said to have a cataract. A photograph confirmed the cataract, but the type and depth were not ascertainable. Sturtz reported 4 cases of moderate myopia without fundus changes. Goldbloom investigated one patient with bilateral anterior subcapsular cataracts with normal color vision, while Goldman noted only hypertensive retinopathy. Williamson found one unexplained retinal detachment.

Mettier's report concerned a family with no ocular, renal, or auditory disturbances in prior generations. The eldest patient had a right central anterior lenticonus and early sclerosis of the left lens nucleus. The second affected member had bilateral anterior lenticonus. There were also degenerative changes in the right fundus at the periphery and an old ("incidental") left retinal detachment. The left fundus showed a corresponding visual field defect. Mettier postulated that the lesion could have been produced by an anterior capsule defect. This defect, in turn, could have been brought about by maldevelopment of the anterior zonules. This type of lenticonus is usually accompanied by an anterior polar cataract. The cause of the lenticular deformation was not known; however, Duke-Elder felt that since the raised portion in lenticonus was composed of clear cortex while the nuclei remained intact and undistorted, the deformity occurred in extrauterine life. He suggested that this condition may have arisen from a weakness and consequent stretching of the lens capsule.

Gregg was able to follow a patient from 1949 to 1961; however, a positive family history consistent with Alport's syndrome was not mentioned. In 1955, the patient had an inflammation of his right eye for four weeks following a history of minor trauma. The left pupil was irregular, and there was a small hole in the anterior lens capsule with some lens extruding. One week later, the anterior chamber was filled with lens substance, and this was aspirated. Three weeks later acute iridocyclitis developed, which responded to cortisone and atropine and resulted in a normal eye. However, four months later, epithelial opacities developed in the anterior vitreous, and the left eye had a small circumscribed bleb on the anterior surface with loculated fluid. This bleb flattened out and became an anterior polar cataract, confirmed microscopically after necropsy. This eye also revealed a reduplication of epithelium in one area and degeneration of the lens fiber in the immediate subepithelial area. Histologic duplication of the anterior lens epithelium around the hyalinized cataractous mass suggested an attempt at repair. In this particular case no inherited, infectious, metabolic, hormonal, or other causative factors for the disease complex were found.

Ohlsson made a study of 3 cases of malignant myopia in a family. All had greater than −20 diopters defect, and 1 experienced three recurrent retinal detachments. While albuminuria was common in this family, the other members had neither deafness or other ocular diseases.

Brownell and Wolter reported a kindred, in which the following pathology was observed: in the eldest male, progressive anterior lenticonus with thinning of the lens capsule and minimal subcapsular cataract at the anterior pole of both eyes was noted; in the youngest affected male, bilateral anterior lenticonus was found. Posterior lenticonus, with a Mittendorf dot in the right eye, and a left anterior polar cataract, were observed in the middle brother; in the mother and 2 daughters of this family slight punctate anterior subcapsular cataracts were noted.

Reynolds described what was probably a variant of Alport's syndrome. Four members of a family, 3 females and 1 male, had nephropathy, deafness, and variable pigmentary degeneration of the macula. Senior et al. presented a new oculorenal dystrophy: in a family of 13 children, 4 had nephropathy, and 6 had a tapetoretinal degeneration, indistinguishable from Leber's tapetoretinal degeneration. Two of these patients had normal audiograms. The relationship, if any, of this new entity to Alport's syndrome is unknown.

Cassady noted cataracts in 4 of his male patients, 2 of whom had terminal uremia, and the other 2 were 62 and 76 years of age. Cataracts were found in 11 affected women whose mean age was 68. No other information about the type of cataracts was provided. Cassady further noted that many patients had myopia greater than −2D as tested with the ophthalmoscope.

Arenberg et al. reported the results of a new family studied for ocular abnormalities, specifically lenticular lesions. Only myopia, which was not felt to be related to Alport's syndrome, was found. The ocular abnormalities associated in the literature with Alport's syndrome were reviewed. It was concluded that although lenticular abnormalities were the most consistent finding, ocular abnormalities occurred so infrequently that it was not necessary to observe ocular changes to make a diagnosis of Alport's syndrome.

Discussion

Early clinicians investigating families with Alport's syndrome observed that certain foods produced an acute attack of gross hematuria in genetically predisposed members. Aitken related that an acute attack of hematuria could be provoked by eating vegetables and apples. He also cited a family (reported by Boyd) in which rhubarb started an attack. Kendall added that black currants, asparagus, strawberries, or claret wine precipitated gross hematuria. It was apparent that something common to these foods had a "hematurogenic" effect on genetically predisposed family members. This unknown component possibly acted to block or otherwise disrupt an enzyme system necessary to the integrity of the kidney. Likewise an enzymatic defect could alter the integrity of the cochlea. Since the site of action of otonephrotoxic agents is not well understood, it is possible that the disturbed enzyme systems are related. No further work with this unusual aspect of the disease has been reported.

Amino-aciduria has been shown to be related to hereditary renal disease. Ohlsson described a family with nephropathy, deafness, and severe myopia. Two of 3 members had abnormal urinary amino acid levels (alanine 86 and 73 mg., glutamic acid 228 and 149 mg., histidine 245 and 435 mg., threonine 59 and 131 mg., and glycine 317 mg.). Efron demonstrated marked deficiency of activity of proline oxidase from liver homogenate at necropsy in the propositus of a family with hereditary hematuria, congenital renal malformation, and mild mental retardation (a possible variant of Alport's

syndrome). The propositus also excreted increased amounts of proline, hydroxyproline, glycine, and a slight amount of serine, threonine, and alanine. Dubach showed hyperprolinemia in 6 of 21 sibs, and in 8 of the 21, urinary abnormalities in proline, hydroxyproline, glycine, and methyl histidine. However, the abnormalities of serum and urinary amino acids were present simultaneously in only 2 patients. It was also shown that the degree of abnormality does not parallel the clinical manifestations. Neither the type of amino-aciduria or serum amino acid abnormality possibly associated with Alport's syndrome nor the postulated enzyme defect has been well studied.

The question of abnormal lipid metabolism has been raised by Perkoff, since occasionally foci of lipid-filled foam cells have been found in the interstitum between the renal tubules at the corticomedullary junction. At necropsy the kidneys were small with diffuse linear lipid streaks seen on gross sagittal sections. Krickstein et al. ruled out a generalized abnormality of lipid metabolism, since they found no lipid-filled foam cells in organs other than the kidney. Dubach's group found elevations of beta lipoprotein, total fat, phosphatides, and neutral fat in a cousin of their propositus and definite hypercholesterolemia in the family. Cassady in a study of 476 members of 6 families with Alport's syndrome, showed a statistically significant decrease in serum lipoproteins migrating in the alpha fraction. However, an abnormality of lipid metabolism is not known to exist with any certainty.

Various abnormalities of protein electrophoresis have been reported: Williamson described increased alpha two globulins and decreased gamma globulins; Chappell and Dubach also found globulin abnormalities. The significance of the results of protein electrophoresis is unclear. The results of immunoelectrophoresis have not been reported for Alport's syndrome.

An elevated coagulation time was noted by Alport, who stated that this elevation could be decreased, with subsequent decreases in hematuria, by the use of calcium chloride. No study of other clotting factors in patients with Alport's syndrome has been recorded.

Much of the clinical description, basic parameters, and natural history of the familial disease complex, Alport's syndrome, is known, but many aspects including the mechanism or pathophysiology are only in the hypothetical stage. This syndrome is a fertile field of research with many unsolved questions for the enzymologist, nephrologist, otologist, ophthalmologist, and pathologist.

Practically speaking, if Cassady's estimate that Alport's syndrome may account for a good portion of childhood nephritis and deafness is correct, then we are not dealing with a relatively rare, esoteric disease complex. Rather, we are faced with an entity of which every physician should be aware. A pediatrician with an idiopathic case of childhood nephritis or an internist with an inexplicable case of progressive renal failure in a young man should take a complete family history and have an audiogram done. Likewise, an otologist, faced with an unexplained progressive neurosensory hearing loss in a child or a refractory case of otitis media should take a complete family history and have the renal status evaluated. Finally, an ophthalmologist, faced with a nontraumatic cataract or an anterior lens abnormality arising in a child should have audiometric and renal status evaluations performed. The results may be surprising.

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A NEW CONCEPTUALIZATION OF THE GERIATRIC PATIENT

Kurt Wolff, MD, Director, Professional Education, Veterans Administration Hospital, Coatesville, Pennsylvania; Associate Professor of Psychiatry, Jefferson Medical College, Philadelphia, Pennsylvania, Geriatrics 23(8):157–162, August 1968.

British investigators F. Post and R. S. Allison, in recent publications, still (1) emphasize the factor of organic brain syndrome due to pathological changes in the brain substance itself or in the circulation of the brain, (2) describe extensively the mechanisms of compensation for this damage and, (3) recommend drug therapy for the geriatric patient. However, in 1959 A. Ferraro, gave importance to the psychological factors in the precipitation of senile psychosis but did not believe that the value of mental hygiene in the prevention of senile psychosis had been sufficiently explored statistically. In 1959, J. E. Birren described a new approach to the geriatric problem by coordinating three basic factors in the process of aging—biological, sociological, and psychological—and made original contributions to the problem of perception and intelligence in the elderly. The same year, the author published *The Biological, Sociological and Psychological Aspects of Aging,* exploring in detail such a coordinated approach to the geriatric problem. According to latest research studies on this field, the following observations have been made and were conducive to a new conceptualization of the geriatric patient.

Biological Components

The biological parameters of the geriatric patient have been investigated by many workers but still represent a great problem. While there are many research derived theories by well known, biologically oriented gerontologists, two deserve special attention.

N. W. Shock attributes great importance to atrophy of the cells, especially of the brain cortex and the musculature. He believes that a large proportion of muscular atrophy is due to disuse. He bases this on observation of athletes who do not show atrophy of those muscle cells which are in continuous exercise. Shock emphasizes motivation by physical conditioning and restoration of functional capacities by progressive exercise. This method certainly involves a positive therapeutic approach in geriatrics by gradual rehabilitation and prevention of atrophy. It is used extensively in physical medicine and rehabilitation centers all over the country.

H. Selye, in contrast to Shock's motivational theory, gives greater importance to the "wear and tear" theory, described in his book, *The Stress of Life.* Selye states that true age depends largely on the rate of wear and tear, on the speed of self-consumption. To him life is essentially a process which gradually spends the given amount of inherited adaptation energy. Vitality is like a bank account which the person can deplete by withdrawals but cannot increase by deposits. Selye stresses that *complete* restoration by rest after exposure to very stressful activities is a false belief. It is true, he says, that immediately after some harassing experience, rest can almost restore the organism to the original level of fitness by eliminating acute fatigue. But the emphasis is on the word *almost.* Since we constantly go through periods of stress and rest during life, these little deficits of adaptation energy every day add up to aging.

Sociological Components

The sociological factors to be considered in connection with the geriatric problem derive from stresses connected with the elderly person's occupation, environment, family, and community. These stresses frequently are conducive to a disturbed emotional equilibrium. Among the sociological factors of great influence on the aging process, forced retirement represents one of the most frequent factors precipitating emotional upsets in elderly people. Retirement often causes severe loss of self-esteem. Many an old person has for years held his mind and body together by compulsive work. Not accustomed to relaxation and not knowing what recreation means, in later life he may have a complete breakdown of physical and mental health revealed by sudden and severe confusion and disorganization.

Elderly persons, therefore, must not only retire from something, but must have something to retire to. To find suitable hobbies and interests for them and to help them recreate a new life is indeed one of the most important goals of our preventive treatment for aged persons.

Disengagement. In contrast to these observations, confirmed by many psychiatrists, E. Cumming and

associates considered aging as a process leading to a disengaged state. They have done an extensive study in Kansas City, Mo., of 211 healthy persons between the ages of 50 and 70. They believe that elderly individuals in our social system engage in a process of withdrawal rather than being deserted by others. This disengagement begins during the sixth decade of life and reflects a withdrawal of object cathexis or concentration of energies and a beginning of anticipation of the aged state. Interactions with the younger persons are constricted and the time of each day spent in the company of others is reduced. The result of this disengaging process is a more self-centered behavior among the ambulatory aged. There is some truth in the observation that elderly individuals frequently want to be left alone, becoming less social-minded and more interested in their own emotional, spiritual, and intellectual life with considerably more time devoted to their own bodily ailments. However, I believe they feel ambivalent about their solitude. They realize that many activities of young persons are undesirable for them and out of their domain. The majority of elderly persons have a different outlook regarding parties, dances, sports, technical interests, economic-political problems, and nightly amusement so important to the younger generation. They are aware they need more sleep and greater periods of rest and relaxation than do younger persons, but still resent being excluded from the younger generation's plans and interests. Although older persons at times withdraw voluntarily from many attitudes, customs, and activities of younger persons, they frequently do so with resentment and disappointment. Their wish to encounter younger persons halfway and find some common goal or interest is often rejected. A great number of elderly persons do not want to intrude into the life of those younger, because of lack of understanding of the other generation's needs and fear of being unwanted.

Rejection. Another influence on the emotional and physical health of our aged is our cultural attitude toward them. In spite of the opinion of a few psychiatrists and sociologists, our attitude remains essentially rejection in our culture, although federal and state agencies try many new ways to change this trend. We live in a world of tension, of compulsion, of work, and of competition, where the elderly frequently are still considered a burden or feel they are considered as such.

Economic insecurity. The third factor of importance is the feeling of economic insecurity. Old persons have to live protected from physical and emotional sickness and from the most urgent needs of our daily life. Public welfare helps when the need arises, but this help should be given willingly and effectively; otherwise it can cause an emotional blow and severe loss of self-esteem. Special housing projects, hospitals for the chronically sick, and rehabilitation and recreation centers must be built. Only in this way can we prevent many emotional and physical sicknesses of elderly people. However, the accent should never be on welfare but on rehabilitation. Most elderly persons can still do useful and meaningful work if they find the right understanding.

Emotional Components

The emotional needs of the elderly person have been described lately by a number of outstanding physicians and psychiatrists. In my experience the older person, in contrast to the emotionally disturbed adult, frequently shows the following characteristic psychological features:

(a) Some problems stem from increased dependency needs of old age. The elderly become dependent on others, economically, emotionally, socially, and medically. Their dependency is enhanced by their difficulties in concentration and by decreased attention span and memory defects. These factors may cause a severe loss of self-esteem, especially when features of a more rigid character or a certain lack of adaptability and flexibility were previously present. Problems of their physical health such as emphysema, chronic arthritis, arteriosclerosis, and others frequently increase their dependency needs.

(b) Many elderly persons never fully accept their own aging as a natural process nor do they learn to live with it. They consider it a severe trauma. They are afraid of losing their physical attractiveness, their strength, and their potency. Cataracts or glaucoma and hearing difficulties may frighten them. Many consider only the negative factors of old age and fail to see the positive ones. Positive aspects of aging center around the elderly person's greater understanding of life, his patience, experience, and wisdom. These permit successful emotional equilibrium. For his purpose, the image of aging has to be changed among aged persons themselves. Braceland particularly emphasized this. Karl Menninger says "hope" in the aging is an important dynamic factor for successful adjustment.

(c) Almost all aged have the fear of dying. With few exceptions, little research or theoretical attention has been given to the thoughts of elderly patients—especially their attitudes, conscious or unconscious, toward death. Rose states that generally

death is welcomed only by those who are suffering great physical or mental pain or by those who have reached such a condition of lassitude that the void of death seems an inconsequential substitute for the void of life. It is noteworthy, however, that even these individuals fear death so acutely that they experience great ambivalence and conflict. Even the older person who has reconciled himself to death is haunted by the actual fear of dying, which affects all his thoughts and expectations.

Wahl notes the dearth in psychiatric and psychoanalytic literature of any systematic description of the fear of death, a fear that clearly is not a clinical rarity. It is important, he says, to study the predominantly magical defenses that are set up against death. Concealment and displacement consume energy that must be drawn from other sources; this results in impaired ability to live in an unhampered, free, and creative way. Meeroo implies that fear of death develops at the Oedipal period; he believes it to be symbolic of the fear of castration that derives from an improper resolution of the Oedipus complex.

Feifel explains that death can mean different things to different persons, depending on individual development and cultural background. Death to some represents a lesson in transcendental truth that would be incomprehensible during life; it may be seen as a friend who brings an end to pain through peaceful sleep. It may be an escape from an unbearable situation to a new life which promises none of the difficulties of the present life. Death may be a final narcissistic perfection granting the individual lasting and unchallenged importance, or a means of punishment and atonement—a gratification of masochistic desires. It can be a means of vengeance that forces others to give the deceased more affection than they were willing to give him during life.

Hutschnecker has explored the personalities of dying patients and describes how each one handled death in terms of his lifelong pattern of adjustment. For instance, the person who desired to be nurtured by others is likely to see death as the return to mother earth, the symbolic substitute for an earlier symbiotic existence in the womb. The person who sought conquest may wish to die a hero to avoid considering himself or being considered a failure. Hutschnecker believes that the physician who is sensitive to the dynamics of dying cannot help but relate those processes to the defenses and problem-solving techniques that the dying person used in day-to-day living.

It is my observation that persons who have difficulties in handling their daily problems and stresses will have the same type of difficulties in handling the problem of dying. On the other hand, those who have been able to balance their lives by integrating primitive instincts with moral, religious, and other demands can, as a rule, accept their own dying maturely.

I have pointed out elsewhere that restlessness and insomnia in the elderly frequently are caused by the fear of dying. I also have related death attitudes to the individual's lifelong patterns and defenses. Any passive-dependent, schizoid, compulsive, or paranoid reactions that characterized a person's life style will be reflected in his attitudes when he faces death.

Recently I have reviewed my work with geriatric patients to try to determine the frequency and nature of death fears, how serious they are, and whether or not other attitudes are involved. During a twelve-year period I have kept detailed notes of depth interviews with 40 geriatric patients in different psychiatric institutions and notes of group and individual psychotherapy with 200 more. The average age of the 240 patients was 64 years. Thirty were women. Thirty-eight percent showed primary chronic brain syndromes associated with cerebral arteriosclerosis, senility, chronic alcoholism, or luetic infections, and the rest showed schizophrenic reactions. None had severe memory defects or great difficulty in concentrating. I included in this study those with delusions and hallucinations if they had some contact with reality and could coherently express their ideas about death and dying. I also included agitated, hostile, and depressed patients.

In 80 percent of all the patients, the problems of death and concern about dying played a most important part in their emotions. One-fifth of them denied in the beginning that they were concerned with these problems. Yet, in later interviews or therapy sessions they openly admitted that they frequently were afraid to fall asleep or to be alone in their rooms because "something might happen" to them or because they "might not wake up any more." Most of these patients liked to keep the light on as late as possible and frequently called the night nurse to get attention for minor physical ailments. More than half were unable to sleep at all without sedatives or tranquilizing medication at bedtime. Their dreams frequently centered around falling into water or swimming in a lake, symbolizing a return to the uterus. It is interesting that nearly all of the patients who showed very little concern about death were diagnosed as having a schizophrenic reaction.

Anxiety of any sort in those patients was much decreased because their emotions were blunted.

(d) Finally, very characteristic of the elderly person is his regard for his goal in life. Many have lost their goal or purpose in life. If the person's profession or occupation represented such a goal, forced retirement is felt as a tremendous blow. When artistic or scientific goals cannot be fulfilled because of physical incapacities, the elderly person is particularly prone to break down medically and emotionally. When the goal in life has been marriage and a close family life, death or absence of near relatives frequently leads to depression and agitation.

The elderly person needs somebody to live for, something to be deeply interested in, something to permit him happiness and fulfillment. Life has to remain meaningful and purposeful. If the goal of life is lost, he becomes emotionally sick and is more prone to physical complaints. This important factor of life goal therefore deserves special consideration in any emotional rehabilitation program for a geriatric patient.

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(The references may be seen in the original article.)

ISCHEMIC MONONEUROPATHY AND MONONEUROPATHY MULTIPLEX IN DIABETES MELLITUS*

Martin C. Raff, MD, and Arthur K. Asbury, MD, New Eng J Med 279(1):17–21, July 4, 1968.

Mononeuropathy is a disorder of a single peripheral nerve, whereas mononeuropathy multiplex is characterized by a simultaneous or successive dysfunction of several peripheral nerves remote from one another. These two syndromes differ from polyneuropathy, which is a more diffuse and symmetrical disorder of nerves.

The term "diabetic neuropathy" encompasses several different disorders of the peripheral nervous system. The most common is a slowly progressive, symmetrical, distal polyneuropathy involving the lower extremities, which presents primarily with sensory symptoms and signs and loss of ankle reflexes. Less common, but usually more disabling, are the asymmetric diabetic neuropathies, including the cranial-nerve palsies, mononeuropathies and mononeuropathy multiplex, in which the onset is more rapid, motor involvement usually outweighs the sensory, and recovery is the rule.

Although the diabetic neuropathies are among the commonest disorders of peripheral nerves their pathology and pathogenesis have remained remarkably elusive. A vascular basis has long been suspected in at least some types, particularly the asymmetric forms, but unequivocal evidence of ischemic lesions in diabetic nerves has been lacking. We have recently reported a case of an elderly diabetic man in whom acute mononeuropathy multiplex developed six weeks before death. At autopsy, multiple small infarcts in the peripheral nerves proved to be the basis for the neuropathy.

We have subsequently reviewed six other cases of mononeuropathy multiplex occurring in association with diabetes mellitus seen at the Massachusetts General Hospital in the last few years.† Together, these seven cases serve to describe clinically and pathologically a disease of the peripheral nerves that has previously been poorly understood and neglected in the extensive literature on diabetic neuropathy.

Case Reports

Case 1.‡ J. B. (M. G. H. 143–17–22), a 73-year-old man, was admitted to the Massachusetts General Hospital in February, 1967, because of weakness of the left leg. He had been in good health until 8 months previously, when he noted polyuria and polydipsia. Three and a half weeks before admission, weakness of the left leg developed over 12 to 24 hours and remained unchanged until death

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†Four of the six patients have been seen and examined by one or both of us.

‡Previously reported by Raff et al.

6 weeks later. He required a cane to walk and complained of a crawling sensation in the left leg.

General physical examination on admission was within normal limits. The blood pressure was 130/80. The legs were of normal color and temperature, and the peripheral pulses were full. On neurologic examination there was severe weakness of the left leg, with muscle strength recorded as 6/10 at the hip, 5/10 at the knee and 3/10 at the ankle and toes. There was moderate weakness of the right leg: 8/10 at the hip; 6/10 at the knee; and 7/10 at the ankle and toes. The left thigh and calf measured 0.5 cm less than the right. Severe diminution in position and vibration sense, and moderate impairment of pain and touch sensation were found in the left leg, most marked distally; a similar but milder sensory deficit was demonstrated in the right leg. Deep tendon reflexes were absent in the left leg, and reduced in the right leg and left arm. The plantar response was flexor on the right and absent on the left.

The erythrocyte sedimentation rate was 34 mm per hour, the 2-hour postprandial blood glucose was 270 mg per 100 ml, and urinalysis showed a 4+ test for glucose and a 3+ test for acetone. Lumbar puncture produced acellular fluid with a protein of 90 mg per 100 ml. An electromyogram revealed denervation in the muscles of the left leg in both femoral-nerve and sciatic-nerve distributions. The hematocrit, white-cell count, electrolytes, blood urea nitrogen, calcium, serum electrophoresis, electrocardiogram and x-ray films of the chest and lumbosacral spine were within normal limits.

The patient required 25 units of NPH insulin for control of the diabetes. In the hospital there was no change in his neurologic status. On the 15th hospital day, the day of intended discharge, he had a sudden cardiac arrest and could not be resuscitated.

Autopsy disclosed massive, bilateral pulmonary emboli. There was moderate atherosclerosis of the lumbar aorta and its major branches, but no occlusions, ulcerated plaques or mural thrombi were seen. The pancreas showed severe hyalinization of the islands of Langerhans, and the kidneys were involved by diffuse glomerulosclerosis. There were no gross abnormalities of the central and peripheral nervous system. The spinal cord, roots, ganglions, peripheral nerves and muscles were extensively sampled. Numerous, small infarcts were scattered throughout the obturator, femoral, sciatic and posterior tibial nerves, particularly on the left, with fewer or no lesions in the other lower-limb nerves. The upper-limb nerves were normal. The majority of lesions consisted of well demarcated areas of necrosis of myelin, axons and adjacent perineurial and epineurial connective-tissue sheaths with a variable proliferation of fibroblasts, Schwann cells and endothelial and perithelial cells. These lesions appeared consistent with the 6-week clinical history, although an occasional lesion appeared older, having little cellular reaction and more fibrosis, and a few were completely hyalinized. Wallerian degeneration was seen distal to the infarcts. Gapless serial cross-sections, 10 μ in thickness, were made of 2-cm segments of the left obturator and left femoral nerve. In examination of over 4000 serial cross-sections, only 1 occluded vessel was found: an intraneural artery in the left obturator nerve, which was occluded by a discontinuous organized thrombus. The vessel wall itself appeared normal. Arteriolar branches from the occluded arterial segments appeared to supply 3 separate areas of infarction; however, we did not find occluded vessels to explain the great majority of the infarcts. Arterioles and capillaries within areas of infarction showed a striking endothelial proliferation, but it was thought that these changes could well be secondary to the ischemia. Although the focal, noninflammatory, destructive nature of these lesions clearly established them as ischemic in origin, the responsible vascular events could not be determined. The spinal cord was normal except for an occasional anterior-horn cell in the lumbosacral area showing axonal reaction. There were no abnormalities in the lumbosacral roots or spinal ganglions, and the lower-limb muscles showed a mild denervation atrophy, more marked on the left.

Case 2. G. M. (M. G. H. 93–72–21), a 65-year-old man, was admitted to the Massachusetts General Hospital on February 1, 1966, with a left foot-drop. He had a history of arteriosclerotic heart disease with angina pectoris and 2 myocardial infarcts, the last occurring in 1956. In 1959 intermittent claudication with cramps in the left calf developed and was completely relieved by iliac endarterectomy in the same year. On December 31, 1965, he awoke in the morning with a complete foot drop and numbness of the lower leg and foot on the left. The weakness remained unchanged, but the numbness ascended to above the knee over the next few days. On admission, 4 weeks after onset, there was marked weakness of dorsiflexion and mild weakness of plantar flexion of the left ankle and toes, and diminished pain and touch sensation over the dorsum of the left foot and anterior aspect of the leg to just above the knee. The distribution of the weakness

and sensory deficit clearly indicated that more than just the left peroneal nerve was involved. The deep tendon reflexes were 2+ and symmetrical, and plantar reflexes were flexor. The peripheral pulses were full. Hematocrit, white-cell count and urinalysis were within normal limits. A 2-hour postprandial blood glucose was 111 mg per 100 ml, but an oral glucose tolerance test gave abnormal results, with blood glucose values of 285 and 223 mg per 100 ml at 1 and 2 hours respectively. The spinal fluid was acellular, with a protein of 27 mg per 100 ml. Lumbar myeography, blood and cerebrospinal-fluid Hinton tests, 24-hour urinary tests for lead and a urinary porphobilinogen test were all within normal limits. An electromyogram showed denervation of muscles supplied by the left peroneal nerve.

Two months after onset the weakness began to improve, and the patient had recovered completely by 3½ months. In June, 1966, 6 months after the initial episode, he complained of an identical but less severe neuropathy that appeared suddenly, with numbness and foot drop on the right, with complete recovery over a 2-month period. When last seen in December, 1967, he was normal on neurologic examination.

Case 3. H. L. (M. G. H. 147–87–96), a 61-year-old man, was well until August, 1964, when pain suddenly developed in the left posterolateral aspect of the thigh and leg, followed in a few days by a rapidly progressive foot drop on the left. He was admitted to another hospital, where he was found to have a fasting blood sugar of 270 mg per 100 ml and a 4+ urinary test for glucose. He was treated with tolbutamide, a diabetic diet and a short leg brace. Six months later, progressive weakness of the right leg developed over a 2-week period and, together with the residual left foot-drop, rendered him unable to walk. Several months later, he noted numbness and tingling in the 4th and 5th fingers of the right hand, and within a few weeks, numbness and weakness developed in the left hand over a 2-week period.

Examination at another hospital in August, 1965, showed severe weakness, wasting and sensory loss in the ulnar-nerve distribution on the left, with less severe changes in the right ulnar distribution. There was marked bilateral leg weakness and atrophy, with complete paralysis of both legs below the knees, and moderate weakness at the knee and hip, more pronounced on the right. The deep tendon reflexes were absent in the legs and decreased in the arms, and there was minor loss of sensation distally in the legs. The peripheral pulses were all palpable. The spinal-fluid protein was 124 mg per 100 ml, and electromyography confirmed the widespread denervation in both legs and left hand.

The patient was fitted with bilateral leg braces and learned to walk with crutches. During the following year, he began to improve slowly, and on examination in December, 1967, the only neurologic abnormality remaining was a mild to moderate weakness of dorsiflexion more than plantar flexion at both ankles, more marked on the left. Deep tendon reflexes were still absent in the legs.

Case 4. P. L. (M. G. H. 127–09–31), a 55-year-old woman, was discovered to have diabetes in 1962, and was treated with a diabetic diet and tolbutamide. In April, 1966, pain suddenly appeared in the right buttock and the posterolateral aspect of the thigh, leg and foot, followed rapidly by weakness of the right leg that progressed for several weeks. On admission to the Massachusetts General Hospital in May, 1966, she was found to have weakness and the electromyographic changes of denervation in the right gluteus maximus, hamstrings, gastrocnemius, tibialis anterior and peroneal muscles and decreased pain and touch sensation in the right foot. The peripheral pulses were full and symmetrical. The erythrocyte sedimentation rate was 42 mm per hour, and the spinal-fluid protein 69 mg per 100 ml. Myelography showed a questionable defect at the level of the 4th to 5th lumbar disk space on the right, and in July 1966, a partial laminectomy and disk excision at the 4th to 5th lumbar and 5th lumbar to 1st sacral disk space on the right was carried out.

After operation her pain and weakness progressed, and large doses of analgesics and several hospital admissions were required. By October, 1966, there was weakness and electromyographic evidence of denervation in muscles innervated by the right sciatic, femoral, obturator and gluteal nerves, and marked pain, dysesthesia and sensory loss to all modalities in the right foot. Intravenous pyelography and lymphangiography to exclude retroperitoneal disease were within normal limits.

In April, 1967, while the pain was diminishing and the strength increasing in the right leg, pain developed acutely in the left anterolateral aspect of the thigh and leg, followed by a rapidly progressive weakness in the leg. Marked weakness of hip and knee flexion and a complete foot drop were noted on the left, with a moderate sensory loss in the left foot. Several weeks later, burning pain along the ulnar aspect of the right hand developed,

and examination showed diminished sensation in the distribution of the right ulnar nerve.

When last seen in September, 1967, the patient was still incapacitated by pain and bilateral leg weakness. She wore bilateral leg braces and was using a walker.

Case 5. M. L., a 71-year-old woman, was well until December 1965, when weakness of the right leg and aching pain in the right knee developed, coming on gradually over a period of a few weeks. On examination, there was complete paralysis of hip flexion and knee extension, severe weakness of thigh abduction and slight weakness of knee flexion and ankle plantar flexion on the right side. The right-knee reflex was absent, and both ankle reflexes were diminished. The only sensory abnormality was decreased vibration sense in the toes. A random blood glucose determination was 400 mg per 100 ml, and treatment with a diabetic diet and tolbutamide was begun.

The pain in the right knee subsided over the next few months, but the weakness was unchanged for almost a year before recovery began. When seen last in November, 1967, the patient was continuing to improve, but there was still moderate weakness about the right hip and knee, and she was still using a walker.

Case 6. M. C. (M. G. H. 108–12–29), a 58-year-old man, was well until January, 1962, when severe pain developed in the anterolateral aspect of the right thigh. On examination, 6 weeks after onset, there was no objective weakness or sensory loss, but the right-knee reflex was absent. The cerebrospinal-fluid protein was 96 mg per 100 ml, and an oral glucose tolerance test showed blood glucose values of 212 and 152 mg per 100 ml respectively at 1 and 2 hours. A lumbar myelogram was normal. The patient was given a diabetic diet, and the symptoms gradually disappeared.

In June, 1964, an acute left 6th-nerve palsy developed, improving over a period of weeks. Tolbutamide was added to the diabetic regimen. In August, 1964, pain appeared in the lower back and anterolateral thigh and knee on the left. After several weeks, moderate weakness of left-hip flexion and slight weakness of left-knee flexion, without sensory loss, developed. Once again the pain subsided after many weeks and strength began to improve.

In July, 1965, pain recurred. It was now in the left lower part of the back and the posterior aspect of the thigh and calf, and after two weeks a left foot-drop developed subacutely. On examination, there was severe weakness of left-knee flexion, ankle and toe dorsiflexion, and mild sensory loss to all modalities in the left foot. The left-knee reflex and both ankle reflexes were absent. Peripheral pulses were normal in both legs. The cerebrospinal-fluid protein was 83 mg per 100 ml. Lumbar myelography showed a small central defect at the level of the 4th to 5th lumbar interspace, and a laminectomy was performed, with removal of the disk between the 4th and 5th lumbar vertebras. After operation the pain persisted, and the weakness continued to progress, with weakness of flexion of the left hip and knee extension developing over several weeks. By January, 1966, the patient was still incapacitated by left-leg pain and weakness and required crutches to walk. When last seen in November, 1966, he was greatly improved, although still complaining of nocturnal pain in the left leg. Hip flexion and knee extension were normal, with minimal weakness of knee flexion and severe weakness of dorsiflexion of the left ankle. There was diminished sensation to all modalities in the lower left leg and foot.

Case. 7. F. M. (M. G. H. 107–43–24) was discovered to have diabetes when she was 48 years old. In November, 1959, at 59 years of age, pain developed in the lower back and posterolateral aspect of the thigh and leg on the right; the pain worsened, and right-leg weakness developed over several months. On examination there was weakness (the severity and distribution of which was not recorded) and hyporeflexia, without sensory loss in the right leg. A diagnosis of asymmetrical diabetic neuropathy was made, and therapy with NPH insulin, 20 units a day, was begun. The pain slowly subsided, and after many months, the leg began to regain strength and eventually recovered completely.

In April, 1965, pain and weakness developed in the left leg, progressing for several months; she considered it almost identical to the pain that she had experienced 6 years previously on the right. Examination in July showed, there was atrophy of the left quadriceps femoris, severe weakness of hip adduction and flexion and knee extension, moderate weakness of hip abduction and knee flexion, and mild weakness of ankle movements, all on the left. A distal sensory loss to all modalities was present in both lower limbs. The left-knee reflex was absent, and both ankle reflexes were depressed. The erythrocyte sedimentation rate was 31 mm per hour, the cerebrospinal-fluid protein was 87 mg per 100 ml, and electromyography showed denervation of muscles in both femoral and sciatic distributions

on the left. After many months, the pain subsided and the weakness improved. In July, 1967, there was still some residual weakness of the left leg, and she was using a cane to walk.

Discussion

The seven cases described serve to emphasize the main clinical features of the asymmetrical diabetic neuropathies, which occur mainly in middle-aged and elderly patients with mild and often undiscovered diabetes. Usually beginning acutely or subacutely, and frequently with pain, they cause muscle weakness and wasting, with hyporeflexia, and relatively less sensory loss. There is a striking tendency for the neuropathy to affect one limb and, after a variable time, to involve the opposite extremity in a similar manner. Of the cranial nerves, the oculomotor is most frequently involved, whereas the proximal nerves of the lower extremities, particularly the femoral, sciatic and obturator, are the most commonly affected spinal nerves. Usually more than one nerve is involved, making it difficult to determine clinically whether the process is affecting roots or nerves, or both, although in our case studied pathologically, it was clear that only the peripheral nerves, and not the roots, were involved. Rarely, cranial and spinal nerves are affected in the same patient. After a variable period of progression, the neuropathy stabilizes, and the patient then recovers over a period of weeks, months or years. The erythrocyte sedimentation rate is often increased, and the cerebrospinal-fluid protein is usually elevated.

Diabetic amyotrophy has been defined as a syndrome of "asymmetrical pain, weakness, muscle-wasting and areflexia in the legs without objective sensory disturbance, in middle-aged patients with diabetes mellitus of relatively short duration." Actually, the patients in many of the reports have had some sensory loss, and most have had sensory symptoms, such as pain, numbness, paresthesia or dysesthesia. Nerve-conduction velocities in the lower-limb nerves have been decreased when measured. Therefore, the clinical picture is in no way different from that of the other asymmetric diabetic neuropathies, and although it has been suggested that it is a disease of the motor end plate, diabetic amyotrophy is almost certainly a proximal neuropathy, involving mainly femoral and sciatic and occasionally other proximal lower limb nerves, and the term should probably be discarded in favor of mononeuropathy multiplex.

There have been very few pathological studies of the asymmetric diabetic neuropathies, but the lesions described in isolated cases have been mainly in the peripheral and cranial nerves and have been consistent with ischemic necrosis, or the expected residuum of such a process in the form of patchy scarring. However, to our knowledge, the findings in Case 1 represent the first time that unequivocal infarcts in nerve have been shown to be responsible for a mononeuropathy multiplex occurring in association with diabetes.

The evidence now available suggests that all the asymmetric neuropathies associated with diabetes are caused by infarction in peripheral or cranial nerves. That infarcts can cause this clinical picture is well demonstrated by polyarteritis nodosa, in which infarcts in peripheral nerves have been shown to be the cause of a mononeuropathy multiplex clinically identical to that seen in diabetes.

The recovery of nerve function in the asymmetric diabetic neuropathies is probably related to regeneration of individual nerve fibers. Assuming that nerves regenerate at a rate of approximately 1 mm per day, it is not surprising that third-nerve palsies recover in several weeks, and palsies of peroneal and femoral nerves in several months, and that sciatic-nerve palsies sometimes take one or more years for recovery. More rapid recovery may be due to remyelination of nerve fibers previously demyelinated in areas where the ischemia was insufficient to cause axonal necrosis. A corollary of this hypothesis is that treatment of the diabetes may not influence recovery, although in the past, various forms of therapy have been given credit for what was probably spontaneous improvement.

Case 1 emphasizes the fact that a vascular pathogenesis in diabetic neuropathy cannot be excluded because clinical evidence of peripheral vascular disease is lacking. Since mononeuropathy multiplex is rarely seen as a complication of typical arteriosclerosis obliterans, it is clear that atherosclerosis of large vessels is neither necessary nor sufficient to produce these asymmetrical neuropathies. Indeed, the vessel disease responsible for the infarcts in nerve remains unsettled. Since the only two rigorous pathological studies did not record sufficient vascular disease within the affected nerves to account for the ischemic lesions, it is likely that important vascular disease lies outside the nerves. It may be that atherosclerosis of the small arteries that give rise to nutrient branches to nerve is the responsible lesion, but this remains to be demonstrated.

Occasionally, in a patient without diabetes an asymmetrical neuropathy, clinically indistinguishable from that seen in diabetes, develops, and no other cause is found. Since the clinical course is identical,

it is very likely that the pathology and pathogenesis of the diabetic and idiopathic varieties are the same. It can be argued that these patients without demonstrable diabetes are all prediabetic and that abnormal glucose tolerance curves would develop if they were followed long enough. Another possibility is that the vascular disease responsible for the neuropathy is not specific for diabetes, but occurs with increased frequency and severity in diabetes. This has been found to be true in most of the vascular lesions that have been described in association with diabetes mellitus. In fact, of all the "diabetic angiopathies," only the nodular glomerulosclerosis of Kimmelstiel and Wilson appears to be specific for diabetes. It may be preferable, then to refer to the asymmetric neuropathies seen in diabetes as "ischemic mononeuropathy or mononeuropathy multiplex associated with diabetes" rather than as diabetic mononeuropathy or diabetic mononeuropathy multiplex.

It is apparent from a review of our cases and those reported in the literature that these asymmetric neuropathies frequently present difficult problems in diagnosis and management. The patients with prolonged pain and weakness are frequently subjected to extensive investigation and not uncommonly to unnecessary disk surgery. It is hoped that with a better understanding of the clinical and pathological features, and with the knowledge that recovery is virtually assured, the management of these patients will be improved.

We are indebted to Vincent Perlo, M.D., Irving Ackerman, M.D., H. Walter Jones, M.D., and Michael Brown, M.D., for providing us with clinical information on their patients.

(The figures and references may be seen in the original article.)

ENVENOMATION BY THE SPIDERS—*CHIRACANTHIUM INCLUSUM* AND *ARGIOPE AURANTIA*

OBSERVATIONS ON ARACHNIDISM IN THE UNITED STATES

J. Richard Gorham, PhD, and Theodore B. Rheney, MD, JAMA 206(9): 1958–1962, Nov 25, 1968.

Two cases of arachnidism were caused by *Chiracanthium inclusum* and *Argiope aurantia*, both common spiders in the domestic environment. Other spiders capable of producing dermal or systemic reactions may be recognized. The hypersensitivity phenomenon makes any spider bite potentially dangerous. Epidemiologic study of arachnidism and the evaluation of its role as a public health problem are frustrated because most cases are unrecognized or unreported. The study of arachnidism and other forms of envenomation would be facilitated by a national repository of information on spider bites and venomous spiders.

The primary objective of this communication is to report two cases of spider bite, one by the "running spider," *Chiracanthium inclusum* Hentz (*Clubionidae*), the other by the "black-and-yellow garden spider," *Argiope aurantia* Lucas (*Araneidae*).

From the National Communicable Disease Center, Atlanta (Dr. Gorham) and the DeKalb Emergency Group, Decatur, Ga. (Dr. Rheney).

Reprint requests to National Communicable Disease Center, Atlanta 30333 (Dr. Gorham).

In view of the scarcity in the literature of any documented cases of arachnidism and the lack of any system for reporting such cases, we wish, as a secondary objective, to emphasize the need for physicians to report confirmed cases either directly in the literature or indirectly through the National Communicable Disease Center. Only after adequate data become available can the public health significance of arachnidism be properly understood.

Venenation by *Chiracanthium inclusum*

The patient, a 22-year-old white man, lives in a house trailer near Stone Mountain, Ga. About midnight on Aug 10, 1967, the patient was lying in bed when he felt something crawling on his left forearm. The patient slapped his arm and the spider bit at the moment of impact. Fortunately, the patient found and kept the spider. About one minute later he began to feel pain at the bite site on the elbow. Fifteen minutes later he was nauseated and felt like vomiting, but the patient did not do so then or later. There was severe pain in the muscles of the upper arm

around the axilla. The pain extended into the pectoralis area on the left side. By this time the patient was firmly convinced that he needed medical assistance.

His wife took him to DeKalb General Hospital, and physical examination was initiated at 1 a.m. (about 45 minutes after the bite incident). The bite site on the elbow was tender to palpation. There was a reddened, nonvesicular swelling, approximately 1.5 cm in diameter. Except for this lesion and the associated pain, physical signs and symptoms were within normal limits. The history revealed no previous difficulty with allergies nor any other factor which could have produced the illness.

The patient complained of persistent intense pain in the upper arm and in the left side of the upper part of the chest. At 1:35 a.m. he was given intramuscular injections of meperidine hydrochloride (50 mg), dexamethasone (4 mg), and tetanus toxoid. At 2:30 a.m. the symptoms were still present. The meperidine and dexamethasone medications were repeated in the same dosages as before. At 3 a.m. the patient stated that he felt much better. After continued improvement, he was permitted to return to his home at 3:30 a.m. Although, according to the patient, residual pain persisted in the arm for at least three days, recovery was apparently complete. There was no noticeable local destruction of tissue at the bite site. The case report and the offending spider were submitted to the National Communicable Disease Center. The spider was a female *C inclusum.*

Several weeks after the spider-bite incident, one of us (J. R. G.) went to the patient's home to look for spiders. There were some unoccupied spider webs, but no spiders of any kind, either dead or alive, and very few other arthropods were observed inside the house trailer. The patient said that he had applied household insecticide after the bite incident occurred. The yard around the trailer home and the entire trailer park were well maintained and sanitary. A few common house spiders, *Achaearanea tepidariorum* Koch, were found under the trailer. A row of uncut weeds, separating the yard from a field of corn, might have provided suitable harborage for *C inclusum,* but none was observed.

Venenation by *Argiope aurantia*

At 2:30 p.m. on Oct 11, 1967, a 43-year-old white woman from Decatur, Ga, sought medical attention at DeKalb General Hospital. The patient was seen by one of us (T. B. R.), to whom she reported that 30 minutes earlier she had been bitten by a large spider. The patient had been on her hands and knees working in the yard when she felt a sharp pain just above the right knee. She reflexively slapped the spot and hit a spider. Even though the patient felt no symptoms other than immediate pain at the bite site, she was sufficiently concerned about the incident to seek medical attention. On the way to the hospital, the patient stopped at a service station and rubbed gasoline on the bite.

At the hospital the patient complained of pain in the groin. This symptom, which developed subsequent to the bite, was suggestive of a neurotoxin. Physical examination revealed nothing unusual. A small lesion, probably irritated by the topical application of gasoline, was present at the bite site on the distal, anterolateral aspect of the right thigh. This lesion consisted of a nonvesicular induration about 0.5 cm in diameter. The induration was surrounded by an erythematous area 3 cm in diameter.

The patient was treated with diphenhydramine hydrochloride, 50 mg, administered orally and triamcinolone acetonide, 10 mg, administered by subcutaneous and intradermal injections. The pain promptly subsided and her fears were allayed. She was released at 3 p.m. The attending physician felt that the mental state of the patient may have accentuated the physical effects of the spider bite. This idea and other questions relating to this case could not be pursued because the patient refused to cooperate. The case report and the spider specimen were submitted to the National Communicable Disease Center. The spider was a female *A aurantia.*

Comment

In 1959 Baerg published a list of six spider species known to be dangerous to man in the United States: the black widow, *Latrodectus mactans;* the red widow, *L bishopi;* the brown widow, *L geometricus;* the brown recluse, *Loxosceles reclusa;* and the running spiders, *C inclusum* and *C diversum.* Almost last and certainly least on Baerg's list was *C inclusum.* Its claim to fame rested on a single confirmed case of mild neurotoxic envenomation in California. The symptoms of our first case, like those of the California case, were also suggestive of a neurotoxin. Another case, presumably involving *C inclusum,* was mentioned by Waldron.

Stahnke and Dengler cite clinical and experimental evidence that meperidine hydrochloride synergizes scorpion (*Centruroides sculpturatus* Ewing) venom, producing an unnecessarily severe reaction in the patient. They recommend long-acting barbiturates,

especially phenobarbital sodium, for relief of systemic pain, and lidocaine hydrochloride for the treatment of local pain. The venom of *C inclusum* has never been tested in this regard, therefore the existence of synergism between it and meperidine hydrochloride cannot be ruled out at this time.

At least two other members of the genus *Chiracanthium* are known to be dangerous to man. *Chiracanthium mordax* (*-diversum*) Koch, a widely-distributed spider in the central and southwest Pacific region, has been associated with cases of envenomation in Hawaii and Australia. *Chiracanthium punctorium* Villers is similarly involved in Europe. There is only one other species of *Chiracanthium* in North America, but in the rest of the world there are many species. Nothing is known concerning the toxic potentials of these species except the three specifically mentioned above. In view of evidence supporting the hypothesis that possession of venoms toxic to man is a generic characteristic of *Latrodectus* and *Loxosceles*, it would not be surprising if the same sort of thing occurs in the genus *Chiracanthium*. Experimental studies are required to elucidate this point.

Contact with Man

Argiope aurantia, the black-and-yellow garden spider, occurs in California, Oregon, and the eastern half of the United States. It is rare or absent from the arid Great Plains and the Rocky Mountain states. This spider is common in yards, gardens, and fields. It seems to be common knowledge that it readily bites under stress. The female garden spider spends most of her life resting on the beautifully symmetrical orb web. She feeds on insects that become trapped in the net. Many people welcome this spider to their gardens because of its beauty and the fact that its diet includes many garden pests. Its large size and brilliant coloration make it easy to see and avoid, at least in daylight.

Direct contact with *A aurantia* might occur in the darkness when a person runs into the web or when a person chances to place some exposed part of the body on top of the spider when it is crawling on the ground. In any case, the opportunity for accidental contact with *A aurantia* would seem quite remote.

Some experimental work has been done with the venom of *A aurantia.* Venom was injected subcutaneously into the hind leg of a white mouse: 5.85 mg of venom diluted in 0.1 cc of distilled water produced localized swelling; 6.62 mg of venom caused a 5-sq mm "wet lesion."

A related species, the silver argiope (*Aargentata Fabricius*), is common in the American tropics (the range extends from southern United States to Patagonia). Professor Ibarra, using himself as an experimental subject, observed three bite incidents by this species and concluded that the venom action was very weak and completely local. A translation of his description of the most severe reaction follows: At noon on May 3, 1939, the spider bit three times on the left forearm; there was immediate local pain that vacillated from mild to moderately severe; at two minutes vesicles began to form at the bite site, and three pairs of fang marks were outlined in red; at ten minutes the whitish vesicles (the largest of which was 10 mm in diameter) stood out clearly against the reddened background, and the pain had subsided but was still felt; the vesicles gradually disappeared and the next day only the six red puncture points were visible.

Professor Ibarra was accustomed to letting known or suspected venomous spiders bite him in order to study the effects of the bites. He described numerous experiments with a dozen species, including *Loxosceles.* These experiments spanned a period of about ten years. We might at least speculate that during these years of experimentation he could have acquired some immunity to certain major antigens in spider venom. Therefore his reaction to the venom of *A argentata* may not have been typical of that of a nonimmune person.

Chiracanthium inclusum is a common spider, widely distributed throughout the United States. Beyond the observations that this species may invade the domestic environment in California and that it is a common house spider in northeastern United States, it was only very recently that significant biological information was added to N. M. Hentz's 1875 observation:

> This spider was always found in tubes of white silk, the female watching her cocoon, which is covered with a very thin coat of silk; the eggs are loose and not glued together. It probably moves out only at night, as its pale colour indicates. The young are deeper in colour even than the mother.

These spiders live in the tops of weeds and other plants. They hibernate in white cocoons on plants or inside rolled-up leaves on the ground. A detailed field and laboratory study of the biology of *C inclusum* was recently completed by Peck.

Considering the habits of the two species, *C inclusum* probably has more opportunities to bite man than does *A aurantia.* But the probability for such direct contact still seems very small indeed. *Argiope aurantia* is sedentary in habit, but *C inclusum* is

cursorial (as the common name implies), nocturnal, and in some areas, domestic. In its nightly food-hunting forays, *C inclusum* must occasionally invade houses and must eventually crawl over people resting quietly in the darkness. If a person senses the intruder and slaps it, or if he inadvertently rolls over the spider, crushing it against exposed skin, then a bite might result. In those geographical regions in which it lives in houses, the opportunities for direct contact between man and spider would no doubt be more numerous.

Identification

The familiar garden spider, *A aurantia,* is easily recognized by its colorful markings in black, yellow, and silver-gray (Fig. 1). *Chiracanthium inclusum* is rather nondescript in appearance, lacking distinctive marks or patterns (Fig. 2). Fresh specimens are greenish white or pale yellow. This is a small spider, about 7 or 8 mm in length. The chelicerae are dark brown. The legs may be darkened at the joints and apices. The dorsum of the abdomen is faintly marked with a median longitudinal stripe.

Observations on Arachnidism in the United States

The six known dangerous spider species in the United States were summarized by Baerg and some additional species were added to the list by Horen and Russell and Waldron. There may well be other dangerous species. If such species exist, they would probably be innocent in appearance, small in size, retiring or nocturnal in habit, and domestic or peridomestic in habitat. The bites would produce only mild, transient symptoms, except in hypersensitized persons, in which case the more severe reaction most likely would be wrongly attributed to some other cause, if a spider were not definitely associated with the case. *Chiracanthium inclusum* fits this picture very well. *Loxosceles reclusa* Gertsch and Mulaik, considered innocuous until a decade ago, also fits this picture fairly well, except that its bite is much more likely to produce a severe reaction. In view of the considerable publicity in the news media about the brown recluse spider and its necrotic bite, current information on the geographic distribution of the brown recluse spider is given in Fig. 3 (not shown).

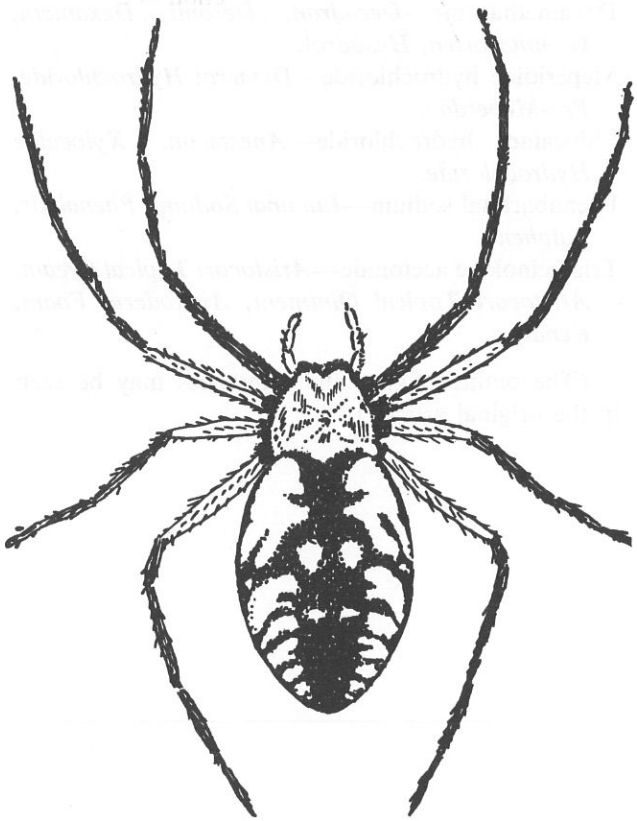


Fig. 1. Dorsal view of *A aurantia* (the black-and-yellow garden spider) with an average length of 22 mm.

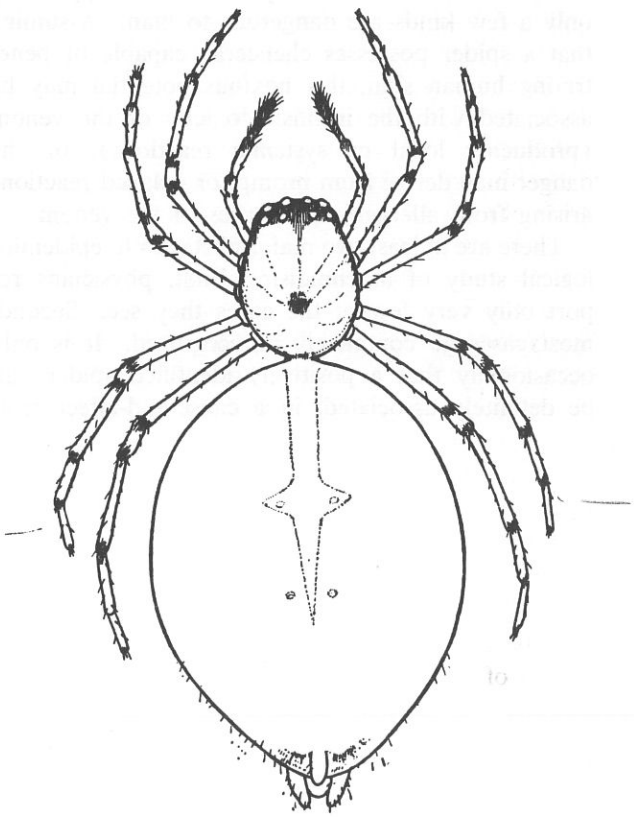


Fig. 2. Dorsal view of *C inclusum* (a running spider) with an average length of 7.5 mm.

Stahnke's recently reported classroom experience and subsequent experimental studies with the venom of *Aphonopelma* species, a tarantula, emphasizes that some of the larger spiders, generally believed innocuous but nevertheless physically quite capable of biting people and injecting venom, must be considered potentially dangerous in light of the phenomenon of hypersensitivity. Stahnke further suggests the ominous possibility that an incident of venenation by an apparently harmless arthropod may provoke an anaphylactic reaction in a person already hypersensitized by the venom of some other arthropod species.

The experimental study of the toxic potentialities of spiders has been greatly facilitated by a new method for collecting spider venom. The anesthetized spider is restrained between expanded plastic cells. Upon stimulation of the spider with a low-distortion sine wave generator, the venom is deposited on an absorbent pad of cigarette paper placed between the chelicerae. The paper is then weighed to determine the amount of venom produced.

People commonly assert that they have been bitten by a "spider," but no one can say at this time just how common arachnidism really is. Practically all spiders are venomous by nature, but apparently only a few kinds are dangerous to man. Assuming that a spider possesses chelicerae capable of penetrating human skin, this noxious potential may be associated with the intrinsic toxicity of the venom (producing local or systemic reactions), or the danger may derive from prompt or delayed reactions arising from allergenic properties of the venom.

There are at least two major obstacles to epidemiological study of arachnidism. First, physicians report only very few of the cases they see. Second, most cases go completely unrecognized. It is only occasionally that a positively identified spider can be definitely associated, in a cause-and-effect relationship, with a patient's symptoms. The patient may be unaware that he has been bitten, he may misidentify the biter on the strength of a fleeting glance, or he may discard the "spider" or "bug," making identification impossible. Bites and stings of uncertain origin must frequently come to the attention of physicians. But certainly most such cases are never seen by a physician, either because the patient simply endures the symptoms or because he considers them unworthy of medical attention.

Epidemiological procedures similar to those recommended by Parrish and Neser for studying snakebite should be developed for spider bite. No proper evaluation of the public health importance of arachnidism can be made without complete case histories associated with identifiable, preserved specimens of the causative spiders.

Chiracanthium inclusum, A aurantia, and *Achaearanea tepidariorum* were identified by Hansell Cross, PhD. Willis J. Gertsch, PhD, confirmed the identifications of *C inclusum* and *A tepidariorum.*

Generic and Trade Names of Drugs

Diphenhydramine hydrochloride—*Benadryl, Valdrene.*

Dexamethasome—*Decadron, Deronil, Dexameth, Gammacorten, Hexadrol.*

Meperidine hydrochloride—*Demerol Hydrochloride, Pro-Meperdan.*

Lidocaine hydrochloride—*Anestacon, Xylocaine Hydrochloride.*

Phenobarbital sodium—*Luminal Sodium, Phenalixir, Talpheno.*

Triamcinolone acetonide—*Aristocort Topical Cream, Aristocort Topical Ointment, Aristoderm Foam, Kenalog.*

(The omitted figure and references may be seen in the original article.)

MEDICAL ABSTRACTS

PHYSICAL ILL-TREATMENT OF CHILDREN

Susanna Isaacs, MB Lond, MRCP DCH, Lancet I(7532):37–39, Jan 6, 1968.

In 22 out of 699 families seen in a child psychiatry department in a three-year period, one or more children had been physically ill-treated. Many families can be helped to avoid further injury to their children, even where no verbal acknowledgment of guilt is obtained. In only 2 families did assistance by the department fail to prevent further child injury. Trained personnel are essential, and will be needed in much greater numbers if preventive work and treatment are to be more widely undertaken.

RECENT ADVANCES IN MALARIOLOGY

Dicran A. Berberian, MD, Amer J Med 46(1):96–117, Jan 1969.

Some of the notable advances in malariology in the past quarter century have been (1) discovery of residual insecticides which ushered in the era of malaria eradication and led to the concept of global eradication of disease; (2) synthesis of antimalarial drugs, their use in the chemoprophylaxis and chemotherapy of malarias and appreciation of their values and limitations; (3) discovery of exoerythrocytic stages in the life cycle of malaria parasites; (4) discovery of rodent plasmodial parasites and their successful transmission through mosquitoes; (5) emergence of drug-resistant plasmodia and insecticide-resistant mosquitoes and some understanding of their genetics; (6) transmission of human plasmodia to monkeys and vice versa; disclosure of multiple new facets of simian and rodent malarias; (7) recognition of the intricate structure of plasmodia through electron microscopy; (8) identification of abnormal hemoglobins and enzyme-deficient erythrocytes and their relation both to malaria and metabolism of drugs; (9) application of new immunologic and biochemical procedures to the study of pathophysiology and immunology of malaria; and (10) establishment of the World Health Organization (WHO) and other national and international agencies to correlate endeavors dealing with the health of nations.

The mechanism of action of antimalarial drugs remains obscure. The efficacy of antimalarial drugs is largely dependent on the following factors: dosage; rapidity of drug absorption; degree of concentration of drug in the plasma, erythrocytes and tissues; rate of degradation and excretion of drug; the immune status of the host; and the species and geographical races of parasites involved.

People differ greatly in their reactions to a specific infection and to a given course of antimalarial medication. Malaria is more severe and more refractory to chemotherapeutic agents in nonimmune subjects than in natives. Nonimmune subjects with primary infections require larger doses of drugs given over a longer period of time than those in relapse. Drug-host reactions determine the outcome of any therapy. Of the several 4-aminoquinolines available, chloroquine and amodiaquin are still adequate for the chemotherapy and chemoprophylaxis of malarias. Patients with relapsing malarias can best be treated by once daily administration of 15 mg. of primaquine base for fourteen consecutive days with concurrent administration of chloroquine (1,500 mg. base orally in three days).

Resistance to drugs may be an innate genetic feature of the parasite, or it may be induced by exposure to subeffective doses of a single drug or one or another in a combination of drugs. Currently the best treatment for chloroquine-resistant falciparum malaria encountered in South Vietnam is a combination regimen with quinine, pyrimethamine and 4,4′-diaminodiphenylsulfone (DDS).

Through the conjoined efforts of governments, the World Health Organization, the Rockefeller Foundation and other agencies, malaria has been eradicated from many countries. Nevertheless, 638 million people live in parts of the world in which the disease is still endemic. It is possible to control and even to eradicate malaria from these endemic foci through judicious use of antimalarials, antilarval measures, drainage, residual spraying and suppressive chemoprophylaxis. Global malaria eradication is the determined and dedicated goal of WHO.

RENAL INVOLVEMENT IN HUMAN LEPTOSPIROSIS

Visith Sitprija, MD PhD, Brit Med J 2(5606):656–658, June 15, 1968.

Renal function was studied in 10 azotaemic patients with proved leptospirosis. In five patients

azotaemia was ascribed to parenchymal renal failure of acute tubular necrosis. In this group the serum creatinine was higher than 2 mg./100 ml. and the osmotic urine and plasma ratio averaged 1.24, indicating a defect in renal concentration. In another group of five patients the renal function study suggested that volume deficit or dehydration might be the cause of azotaemia. The serum creatinine was lower than 2 mg./100 ml. and the mean osmotic urine and plasma ratio was 2.35. In both groups there was a decrease in endogenous creatinine and para-aminohippurate clearances; the decrease was more pronounced in group 1. Because of the clinical inaccuracy in detecting dehydration the serum creatinine and the osmotic urine and plasma ratio may be used as a clue in ascertaining the cause of azotaemia, and thus provide useful information regarding the fluid therapy of azotaemic patients with leptospirosis.

EPIDEMIC SALMONELLOSIS IN HOSPITALS AND INSTITUTIONS

S. A. Schroeder, MD, B. Aserkoff, MD, and P. S. Brachman, MD, New Eng J Med 279(13):674–678, Sept 26, 1968.

During the period 1963–1967 the Salmonella Surveillance Report recorded 40 epidemics of salmonellosis in hospitals and institutions, involving 3,025 patients and 43 deaths. Epidemics occurred in newborn nurseries, pediatric wards, general-hospital wards, nursing homes and mental institutions. Epidemics involving children were smaller and associated with higher case fatality ratios and more often spread by cross-infection than outbreaks affecting adults. Common-vehicle outbreaks were usually limited to adults and were most frequently due to eggs or egg products. Early detection of outbreaks requires an alert hospital surveillance system. In common-vehicle outbreaks, the contaminated vehicle must be identified and removed. In cross-infection outbreaks, a search for human excreters and contaminated environmental objects must be made. Cross-infection outbreaks are difficult to halt and require vigorous enforcement of hygienic technics, isolation of salmonella excreters and patients admitted with diarrhea (pending stool-culture results) and early discharge of infected patients.

MANDATORY OPERATION FOR PENETRATING WOUNDS OF THE ABDOMEN

A. L. Maynard, MD, and G. Oropeza, MD, Amer J Surg 115(3):307–312, Mar 1968.

Laparotomy was performed on 438 patients whose injuries were diagnosed as, or suspicious of, peritoneal penetration. Twenty-four deaths occurred, an operative mortality of 5.5 percent. Four hundred twenty-nine patients had emergency (mandatory) procedures and nine had delayed laparotomy after twelve hours to five days of surgical observation. Intraperitoneal injuries were found in six of these nine patients and three had sustained no visceral damage.

In a substantial number of patients in this series, preoperative physical signs proved to be misleading, both for penetration and for nonpenetration. Preoperative physical evaluations often did not correlate with operative findings and frequently were contradictory.

On the basis of the authors' experience, as well as the reported results of others, they are persuaded to adhere to mandatory laparotomy in preference to "conservative surgical observation" in the management of abdominal wounds.

ACUTE MOUNTAIN SICKNESS

Inder Singh, MB (Rangoon), FRCPE FRCP (Glasg.), FAMS, et. al., New Eng J Med 280(4):175–184, Jan 23, 1969.

Observations on acute mountain sickness occurring between 11,000 and 18,000 feet, in 1,925 men, 18 to 53 years old, showed no direct relation between altitude and severity of illness; mild, moderate and severe cases occurred at all altitudes. A time lag of six to 96 hours between arrival and onset of symptoms ruled out any direct relation between hypoxia and acute mountain sickness. During this period there was clinical evidence of respiratory dysfunction with slow, irregular or Cheyne-Stokes breathing, pulmonary congestion and antidiuresis. In one biopsy and two autopsy studies there was evidence of cerebral edema. Diuresis induced with furosemide provided effective routine therapy. Morphine and betamethasone were used as additional aids in severe cases. Clinical features of acute mountain sickness were ascribed to hypoxia, pulmonary congestion, increased cerebral blood flow, increased cerebrospinal-fluid pressure and cerebral edema.

RESEARCH SECTION

APPLICATION OF A SYSTEM APPROACH TO THE NAVY MEDICAL DEPARTMENT EDUCATION AND TRAINING PROGRAMS

Ouida C. Upchurch

This is a five-year study authorized by the Surgeon General of the Navy to develop and implement an education and training system for the Navy Medical Department.

The Navy Medical Department is composed of approximately 40,000 military and 12,000 civil service personnel. Of these, approximately 14,000 military and 1,000 civil service personnel annually complete formal courses of instruction. Also, a large number of Medical Department personnel participate in structured inservice education and training programs. Almost all personnel are involved in on-the-job training. Medical Department education and training programs are conducted within 38 naval hospitals, several training centers, numerous dispensaries and other medical facilities and Navy activities. There are 87 formal organized courses that extend in scope from the basic training of Hospital Corps personnel to the training of resident physicians to meet the qualifying requirements of national specialty boards. Many of these courses are given in more than one location.

Nature of the Problem

By nature, the education and training of health personnel—doctors, dentists, nurses, administrators, medical specialists, scientists, and technical assistants—is complex, sophisticated, time-consuming, costly, and difficult to assess.

The Medical Department must conduct extensive education and training programs in many widely dispersed locations under varying conditions and for numerous categories and levels of enlisted and officer personnel, as well as for many classifications of Federal Civil Service personnel.

By tradition, education and training programs have been oriented toward "historical proficiency," that is, toward proficiency directed to tasks as they have been understood in the past. Because past tasks and past proficiencies may not meet present or future health care demands, it is imperative that training programs take into consideration the current and future behavioral requirements for each task or job. Through well designed and conducted research, job and training requirements can be ascertained. The Navy Medical Department training programs based upon these requirements can result in the achievement of a more favorable cost/effectiveness basis for the entire Medical Department education and training system.

In providing personnel capability for maintaining the health of the operating forces, a critical problem for the Navy Medical Department is that of effectively overcoming limitations associated with manpower resources. Constraints underlying manpower utilization will continue to be generated by the rising volume of scientific discoveries, by the rapid advances in medical technology, by the increasing industrialization of medical facilities, by the increasing demands of personnel for health care, and by the high turnover of trained personnel through termination of military service.

While scientific discoveries and technological advancements have resulted in greatly improved health care, they also have generated heavy demands upon Medical Department manpower resources. Thus, manpower resource requirements will continue to increase in scope and complexity until improved procedural systems and behavioral science technologies can be developed that will make possible policies, plans, and programs capable of meeting training demands with the required levels of effectiveness and efficiency.

Significant improvements are especially needed to define and measure Medical Department personnel performance and associated training standards and requirements; to reduce the high costs of training as measured in dollars and training time; to maintain personnel proficiency levels, once achieved, without removing personnel from operations; to improve the quality control aspects of on-the-job as well as formal training; and to improve the planning of training programs for alternative levels of operating readiness in support of short and long range plans.

Approach

The feasibility testing of the systems approach to Navy Medical Department education and training has been programmed into three major parts. As shown in Figure 1, each of these three parts has been

divided into major tasks and subtasks. The time frame for the accomplishment of each milestone has been set and the end product for each major task has been named.

Major Part I is concerned with the training system requirements and is comprised of two major tasks, a description of the current system and an identification of the training system requirements. The first major task will provide for the central collection, compilation and analysis of all education and training materials in the Medical Department and will result in a detailed, documented description of the Medical Department's present system of education and training. The description of current training programs will include what is taught, how it is taught, why it is taught, and what the differences are in courses taught at multiple locations. The second major task will yield a training system model that will specify overall training needs of the system, requirements for training research, and programming and specifications for system structure and function.

Major Part II deals with subsystem research and development and is divided into two distinct but related major tasks; namely, a job and performance analysis and a determination of education and training technology. The first major task will be comprehensive determination of job and performance requirements for all Medical Department personnel, incorporating proper sampling procedures by geographic zone for each type of facility and activity and for each staff corps and its subpopulations. The result of this effort will culminate in a documented analysis of job and performance requirements for all categories of Medical Department personnel coupled with a plan for determining training requirements and identifying training needs within the Department.

The second major task is concerned with education and training technology research and includes three subtasks; determination of instructional methodology, development of training technologies, and the formulation and specification of training subsystems. The first subtask, instructional methodology, will include methodology dictated and programmed by the training systems requirements investigation carried out in the first major part and augmented by the initial job and performance analyses data in the second major part. This research will, in general, determine the means of validating the relative efficacy of different instructional modes.

The second subtask concerns relating the development of training technologies to the training needs that have been defined in the first year of the study and analyzed during the first portion of the job and performance analysis. Training technology research will be oriented toward the development and evaluation of various instructional techniques and aids available to the teaching art.

The third subtask will include the results of the research and development efforts of the first two major parts. It will culminate in the formulation and specification of training subsystems that will form the building blocks of the education and training system to be recommended for the Medical Department. These subsystems building blocks will consist of validated specifications for instructional content and instruction technologies based upon documented job and performance requirements, training requirements, and training needs.

Major Part III will include three sequential major tasks which will result in a validated system ready for implementation.

The first major task will consist of two subtasks: the developing of family or core curricula for each of the five staff corps and for use across corps as determined by common performance requirements; and, the integration of appropriate instructional methodologies and technologies for all curricula. Both of these subtasks will be accomplished concurrently with those subtasks in the second major part.

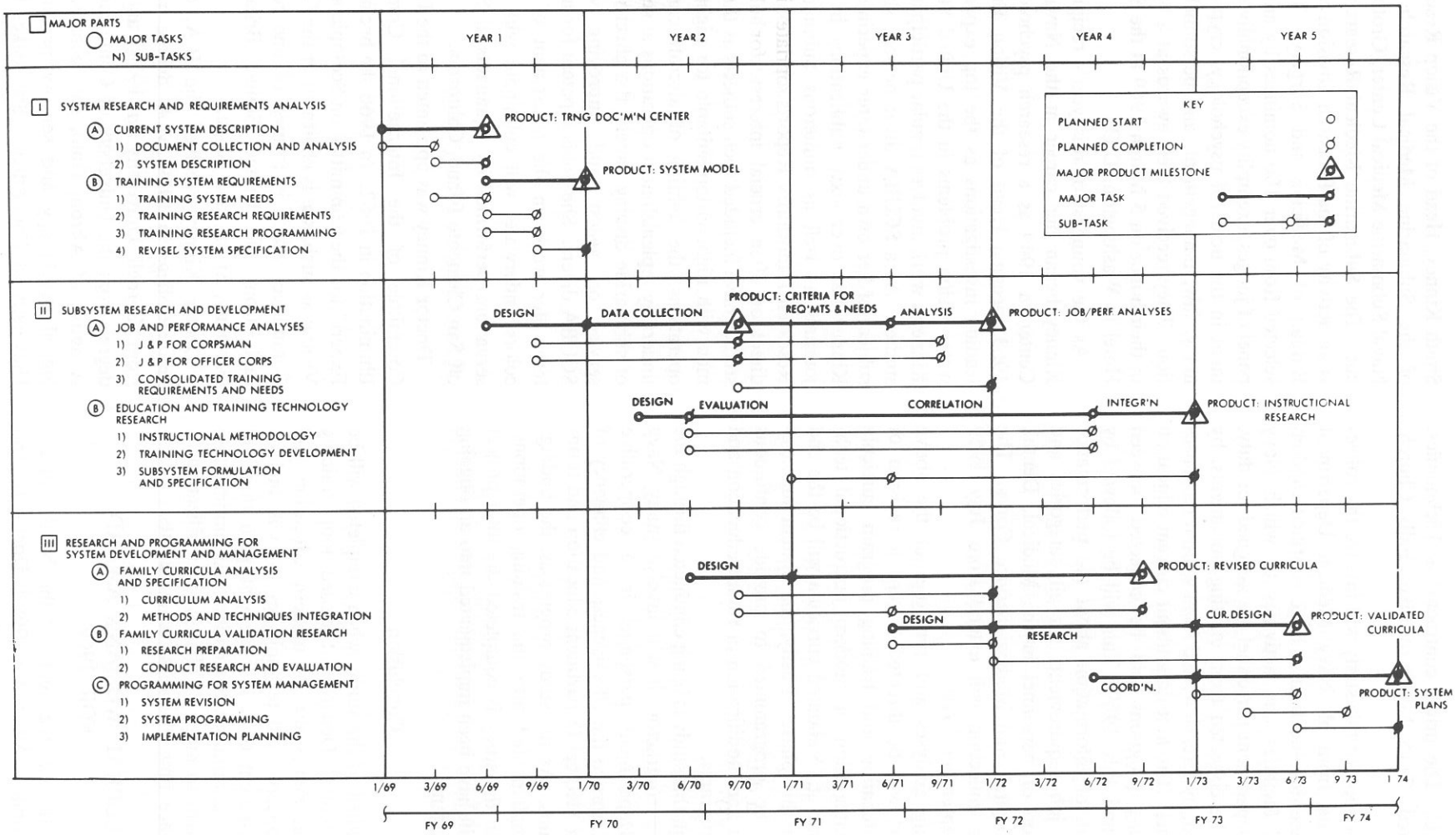
The second major task will be the conduct of the validation research for the core curricula specified above. Validation will be divided into, first, the necessary period of administrative and scientific preparation and, second, the actual conduct of research and evaluation.

The third major task, programming for system management, will specify the appropriate revision of the architectural model for the education and training system as a whole that was set forth in the first major part of this approach. This task will provide a management plan for continuous assessment and modification of the Navy Medical Education and Training System for meeting all levels of manpower mobilization. It will also ensure a set of implementation plans needed by operational training to implement the validated system.

Conduct of the Study

This study is being conducted by the Education and Training Sciences Department, Naval Medical Research Institute, Bethesda, Maryland, under the auspices of the Research Division, Bureau of Medicine and Surgery, Department of the Navy, Wash-

FIGURE 1. MASTER MILESTONE PROGRAMMING



ington, D.C. The prime contractor is Technomics, Incorporated, 7115 Leesburg Pike, Falls Church, Virginia.

The execution of this study will involve the collection of data from all Navy Medical Department training facilities and from a large stratified random sample of facilities and activities to which Navy Medical Department personnel are assigned for duty. Data will be collected from existing documents, by observation, by interview, and from written responses of personnel. The first data about current education and training programs will be collected between February and July 1969. This will be followed by a collection of information about the performance tasks and job requirements for all categories and classification of personnel in the Medical, Dental, Nurse, Hospital, and Medical Service Corps. The latter data collection will extend from July 1969 through September 1970.

Following analyses and syntheses of the above data, effort will be directed toward a revision of existing education and training program curricula and the integration of modern instructional technologies into it. Validated curricula will be the end product of this phase. Lastly, the system management will be programmed to provide continuous assessment and modification of future education and training programs.

Although this study is being conducted through the efforts of a contractor, it will involve many Navy Medical Department personnel in a cooperative action to improve the effectiveness and efficiency of the present Medical Department education and training programs. As the study progresses, the findings will be implemented into the training operations. Thus, when the study is completed the total project findings will have been implemented into an ongoing training system.

Conclusion

The product of the study, when completed will be a Navy Medical Department closed loop training system that makes use of modern education and training concepts and technologies. It will include the establishment of a management plan that will provide for continuous evaluation and modification of the system to meet all phases of mobilization as well as peace time operation requirements.

FEDERAL WOMAN'S AWARD FOR 1969

One of the six recipients of the Ninth Annual Federal Woman's Award for 1969 is Doctor Jo Ann Smith Kinney, Head of the Vision Research Branch of the Submarine Medical Research Laboratory, Naval Submarine Medical Center, Groton, Connecticut. The Submarine Medical Research Laboratory is an activity of the Research Division of the Navy's Bureau of Medicine and Surgery. The winners, selected from over 100 nominees by an independent panel of judges, exemplify exceptionally high achievement in the fields of psychology, cryptology, diplomacy, law, management, and personnel administration. They received their awards at a banquet given in their honor on 5 March 1969 at the Statler Hilton Hotel in Washington, D.C.

As the youngest of this year's recipients, Doctor Kinney began her career at the Naval Submarine Center in 1949 as a research psychologist and, in 1963, became Head of the Vision Branch. Now leading investigations as the top expert on underwater vision problems in the United States, Doctor Kinney's work involves regular participation in ocean studies. As a SCUBA diver herself, she is often a subject of her own underwater experiments. Doctor Kinney has over sixty publications in professional journals as well as numerous Submarine Medical Research Laboratory Reports on vision problems of direct or often crucial interest to the Navy. Her studies have included such subjects as the selection of men with night vision suitable for night time Naval operations, the lighting of aircraft carriers during underway replenishment operations at sea, the design of submarine display panels, the effect of submarine service on vision, and improving visibility for SCUBA divers. She holds a patent for a night vision test. Her work on the assessment of visibility of colors underwater will culminate with specific observations performed by aquanauts at SEALAB III off San Clemente Island, California.

Doctor Kinney was appointed to the U.S. National Committee of the International Commission on Illumination in 1962. In 1966 she became the "U.S. Expert" for the Committee on Scotopic and Photopic Vision; as such, she is chairman of the U.S. National Committee, which is formed of one representative each from the United States, Britain, France, Germany, Spain, and Russia.

Doctor Kinney received the B.A. degree from Smith College in 1949, M.A. degree in psychology from Cornell University in 1954, and the Ph.D. degree from the University of Connecticut in 1959. A native of Akron, Ohio, she lectures on physiological psychology and sensory perception at the University of Connecticut. She makes her home in

Mystic Connecticut, with her husband Donald P. Kinney, who owns a real estate company.

NAMRU–3 ATTENDS SYMPOSIUM

Staff members of the U.S. Naval Medical Research Unit No. Three, Cairo, U.A.R., were invited by the Egyptian Ministry of Scientific Research to attend the First African Symposium on Bilharziasis in Cairo from 8 to 13 February 1969. Not only did NAMRU–3 attend, but contributed greatly by presenting eleven papers on various aspects of Bilharziasis. Over seventeen major topics were discussed at this symposium, which manifests one way in which NAMRU–3 is furthering the existing cooperation in medical research between the U.S. Navy and the Egyptian government.

DENTAL SECTION

CURRENT METHODS OF CARIES PREVENTION

CAPT G. H. Rovelstad, DC USN, Dent Abs 14(2): 78–79, Feb 1969.

Historically, dentistry has progressed from a surgical era, to a restorative era, and to a preventive era in which the prevention of dental disease is stressed.

Preventive dentistry, aimed at the prevention of the initial stages of dental disease or deformity, has the goal of preserving the natural dentition and its supporting structures in the best possible natural state of health. This requires knowledge of the etiology and pathology of dental disease in order to apply the most effective therapeutic measures for prevention and control of that disease.

Five factors in the etiology of caries can be identified as microorganisms, carbohydrates, susceptible patients, focal areas of confinement, and environmental conditions.

The approach to prevention of caries takes several forms: to reduce plaque formation, to increase the resistance of the tooth structure, to reduce the number of sites for the confinement of the bacterial plaque, to interfere with optimum carious conditions, and to reduce the source of nutrients for the cariogenic microorganisms.

Timing of home oral hygiene practices right after meals provides the means for interfering with the optimum conditions required for caries attack. Since the bacterial action harmful to the tooth occurs immediately after sugar contact with the teeth, brushing or rinsing the teeth immediately after eating should be practiced regularly.

Thus, a complete program for the prevention of caries includes proper oral hygiene, control of sugar eating habits, fluoridation, topical application of fluorides, use of fluoride dentifrices, early practice of exacting operative technics, and thorough cleansing after meals.

Future areas of promise in the prevention of caries are centered on measures to protect against the infecting microorganisms in the manner used for the control and prevention of other bacterial infections, including interference with bacterial products essential to plaque.

In summary, the disease of caries can be prevented by a cooperative effort involving the dentist, the dental hygienist, the patient, and the community. The program must be directed against the disease and not just the consequences of the disease. Cavities are late consequences of the disease and must be treated by proper restoration, not only to restore the tooth to function but to help eliminate the bacteria and prevent the subsequent infection of other teeth.

(Rovelstad, Gordon H. USNTC Building 600, Great Lakes, Ill. Current methods of dental caries prevention. Northwest Dent 47:233–236, July-Aug 1968.)

IN VITRO STUDY OF THE PHYSICAL CHARACTERISTICS OF ENDODONTICALLY TREATED TEETH VS. NON-TREATED TEETH

LCDR C. A. Lowe, DC USN.

It has been observed that endodontically treated teeth tend to fracture in time. Many have theorized that this is caused by a "brittleness" that develops as a consequence of drying. The purpose of this

The opinions and assertions contained herein are those of the author and are not to be construed as reflecting the views of the Navy Department or the naval service at large.

study was to examine certain physical characteristics of endodontically treated teeth to determine if there is a measurable change associated with time. The teeth were opened, extirpated, instrumented, and irrigated with sodium hypochlorite solution, half were filled with silver points and sealer, and the other half were allowed to remain open. All teeth were then stored in 0.9 percent NaCl solution at room temperature. Periodically, after 45 to 123 days, pairs of teeth were removed from the solution and sectioned so that dentin hardness and water content could be determined. Knoop Hardness Numbers were computed with a Tukon Hardness Tester. These hardness tests were made on 3 to 4 mm section cut from the area of the cementoenamel junction. Water content was determined by weighing cementum-free root sections before and after drying them for 24 hours at 100°C. There was no significant difference in water content or hardness between the filled and unfilled teeth, and no relationship was observed between water content and hardness in any of the teeth.

(Abstract by Research Work Unit: MR005.19–6052 by LCDR C. A. Lowe, DC USN.)

A DEVICE FOR MEASURING INTER-OCCLUSAL DISTANCE DYNAMICALLY

CDR R. S. Davidson, DC USN and LCDR R. G. Preece, DC USN.

Determination of a patient's interocclusal distance and/or vertical rest dimension by the use of two points located on soft tissue is both difficult and inaccurate. Dividers or other instruments for measuring the static distance between these points are unreliable; therefore, a device was constructed to monitor and measure dynamically the vertical movements and positions of the mandible. This device was a lever pivoting on a frame attached to the patient's head. One end of the lever rested against a plastic plate secured to the inferior border of the chin; the other end was placed against a calibrated scale. Measurements of distance could be read directly from the scale during vertical movements of the mandible. The device was used to evaluate the effect of chair type and patient positioning on measurements of interocclusal distance. The study included 10 subjects, seated in contour and standard chairs, both in erect (90°) and reclining (120°) positions. A total of 200 measurements were made. No significant differences were found between any of the four situations.

(Abstract by Research Work Unit: MR005.19–6052 by CDR R. S. Davidson, DC USN and LCDR R. G. Preece, DC USN.)

The opinions and assertions contained herein are those of the authors and are not to be construed as reflecting the views of the Navy Department or the naval service at large.

PERIMOLYSIS—REPORT OF A CASE

J. J. Linkon, R. E. Roper, and R. A. Wiedlin, J S Calif State Dent Assn 36(2):65–68, Feb 1968.

Perimolysis, the disappearance of tooth substance, is a gross loss of enamel as a result of persistent vomiting or regurgitation. This report is of a chronic alcoholic whose history, among other conditions, included nausea, vomiting, and rumination after each meal and at night during the period August 1, 1966 to February 15, 1967. All medications, including antabuse therapy for alcoholism, were discontinued and the patient was discharged from the hospital with the diagnosis of vomiting caused by antabuse therapy. The patient was referred to the dental clinic for treatment of his hypersensitive teeth. Oral examination revealed: normal oral mucosa, lips, tongue, palate and salivary glands; 5-mm pockets in the molar regions; loss of enamel exposing the dentin of maxillary posterior molars; marked loss of occlusal enamel from the mandibular teeth; marked attrition of the occlusal surfaces of the bicuspids with facets reaching almost to the pulp chambers; shortened upper anteriors with sharp incisal edges and the lingual surfaces reduced almost to the pulp chambers; and hypersensitive teeth. Radiographic examination revealed moderate bone loss, blunting of alveolar crests, thickening of the periodontal ligament in the anterior regions, some change in bone density in the bicuspid region, and moderate caries. The initial treatment plan, which was carried out, included: prophylaxis and periodontal therapy, desensitization of the teeth, a mandibular bruxism splint, a temporary splint on the maxillary anterior teeth, and restoration of the carious teeth. A reevaluation of the patient's progress and cooperation were to be made before full mouth rehabilitation was begun. The prognosis appeared poor because of the patient's deep psychological problems.

(Abstracted by: CAPT Nelson W. Rupp, DC USN, Ret.)

INCIDENCE AND DISTRIBUTION OF VARIOUS CONNECTIVE TISSUE FIBERS IN ORAL FIBROMAS

R. D. Oles, Oral Surg 26(4):487–496, Oct 1968.

Microscopic sections of 25 oral fibromas obtained by excisional biopsy were subjected to a battery of stains and histochemical procedures. The incidence and distribution of precollagenous reticulin fibers, collagenous fibers, oxytalan fibers, and elastic fibers in the specimens were studied. None of the fibromas contained precollagenous reticulin fibers, thus indicating that active growth of the collagenous portion of the fibrous connective tissue stroma was not occurring. All of the fibromas were composed predominantly of collagenous fibers which showed great variation in size and distribution. Eight showed a well-defined lamina propria between the tumor mass and the overlying epithelium, suggesting an origin from submucosal tissue. Elastic fibers were found in 17 specimens, and oxytalan (pre-elastic) fibers in 21 specimens. The elastic and oxytalan fibers, when present, assumed two distinct patterns of distribution: a homogenous distribution of fibers with no marked regional concentrations and a subepithelial concentration of fibers with other fibers scattered throughout the fibromatous stroma. It has previously been reported that elastic fibers in cutaneous wounds are not found for periods of months or years following the time of injury and that benign tumors of mesenchymal origin seldom form elastic fibers. The presence of elastic fibers in some of these lesions would therefore, indicate that they are of inflammatory or reparative origin and that a considerable period of time had passed since the injury which produced the initial reaction was inflicted.

(Abstracted by: CAPT George H. Green, DC USN.)

PERSONNEL AND PROFESSIONAL NOTES

TRAINING SELECTIONS

The Dental Training Committee convened in the Bureau of Medicine and Surgery in January to select dental officers for graduate/postgraduate training, Naval Dental School, residency type training, and postdoctoral fellowship training in Fiscal Year 1970. Ninety-three dental officers were approved for advanced training.

Courses at Naval Dental School—Approved (32)

Graduate/Postgraduate Courses in General Dentistry (17)

1. LCDR A. J. Bourgeois, Jr.
2. LCDR C. A. Ciardello, Jr.
3. LCDR J. E. Dice
4. LCDR D. L. Fishel
5. LCDR P. Kasenchak
6. LCDR R. W. Koch
7. LCDR J. L. Luhtala
8. LCDR R. B. McCoy
9. LCDR P. J. Reisman
10. LCDR C. L. Sabala
11. LCDR D. L. Scoralle
12. LCDR R. G. Shaffer
13. LCDR D. B. Stalb
14. LCDR C. R. Vath
15. LCDR O. B. Walker
16. LCDR J. T. Werning
17. LCDR R. W. Wickord

Graduate Courses in Oral Surgery (4)

1. LCDR K. W. Besley
2. LCDR K. L. Cottle
3. LCDR C. S. Huttula
4. LCDR J. P. McMahon

Graduate Courses in Prosthodontics (6)

1. LCDR L. A. Ashton
2. LCDR G. A. Bloch
3. LCDR C. E. Branyan
4. LCDR G. W. Eastwood
5. LCDR R. L. Skyberg
6. LCDR T. H. Sugg

Graduate Courses in Endodontics (3)

1. CDR M. Brenyo, Jr.
2. LCDR M. Ervin, Jr.
3. LCDR A. E. Krzeminski

Graduate Courses in Periodontics (2)

1. LCDR S. A. Glazer
2. LCDR R. C. McMurdock, Jr.

Oral Surgery Training—Approved (24)

Residency-type (16)

1. CDR M. S. Burch Second Year Level
2. LCDR L. L. Bowen Second Year Level
3. LCDR C. A. Brown Second Year Level
4. LCDR A. D. Loizeaux Second Year Level
5. LCDR R. B. Maw Second Year Level
6. LCDR S. J. Poidmore Second Year Level
7. LCDR J. E. Yacabucci Second Year Level
8. LCDR J. E. Yeager Second Year Level

1. CDR M. R. Cummings Third Year Level
2. CDR J. J. Verunac Third Year Level
3. LCDR P. W. Connole Third Year Level
4. LCDR B. J. Devos Third Year Level
5. LCDR R. E. Hillenbrand Third Year Level
6. LCDR G. W. Oatis, Jr. Third Year Level
7. LCDR D. J. Smith Third Year Level
8. MAJ C. G. Taylor, USAF Third Year Level

Postdoctoral Fellowship (8)

1. CDR R. L. Parsons
2. LCDR J. E. Albright
3. LCDR J. L. Burk, Jr.
4. LT N. T. Crowell
5. LT D. G. Hillenbrand
6. LT R. C. King
7. LT M. L. Milford
8. LT M. T. Ridley

Prosthodontics Training—Approved (15)

Residency-Type (6)

1. CDR R. K. Fenster
2. CDR D. G. Garver
3. LCDR A. R. Hube
4. LCDR E. R. Hudson, Jr.
5. LCDR M. M. Stevens
6. LCDR J. E. Trainor

Postdoctoral Fellowship (9)

1. CDR C. D. Nester
2. LCDR J. M. Allen
3. LCDR D. G. Badger
4. LCDR C. R. Cowen
5. LCDR J. R. Holtan
6. LCDR J. H. MacPherson
7. LCDR H. C. Mullins
8. LT A. P. Bickenbach
9. LT P. Kobes

Periodontics Training—Approved (10)

Residency-type (3)

1. CDR C. R. Diem
2. LCDR P. W. O'Shields
3. LCDR W. J. Toth

Postdoctoral Fellowship (7)

1. LCDR K. F. Batenhorst
2. LCDR D. L. Gaston
3. LCDR C. H. Julienne
4. LCDR J. S. Lekas
5. LT R. C. Hirst
6. LT R. L. Martin
7. LT E. R. Nelson

Endodontics Training—Approved (9)

Residency-type (4)

1. LCDR T. H. Chapman
2. LCDR S. Montgomery
3. LCDR R. A. Murphy
4. LCDR N. H. Tracy, Jr.

Postdoctoral Fellowship (5)

1. LCDR G. C. Robinson
2. LCDR L. S. Vazzana
3. LCDR J. D. Walsh
4. LT J. C. Kehoe
5. LT J. F. Koenigs

Oral Medicine Training—Approved (1)

Residency-type (1)

1. LCDR R. R. Eklind

Oral Pathology Training—Approved (1)

Residency-type (1)

1. LCDR G. L. Pierce

Dental Science and Research—Approved (1)

Long Course at Civilian University (1)

1. LCDR E. P. Leonard (Continuation)

NEWLY STANDARDIZED DENTAL ITEMS

The following dental items are now available:

6520–250–5887	Rubber Dam, Special Heavy, 18 feet	RL	1.66
6520–584–3463	Handpiece, Dental, Straight, Round Nose (Belt driven)	EA	49.00
9535–531–2050	Tin Foil, ½ lb	RL	2.90

DENTAL HANDPIECE ADAPTOR KIT

The description of the dental handpiece (Midwest Tru-Torc) Index #3558 in the Federal Supply Catalog indicates that this item cannot be used with the Ritter Modulaire dental operating unit, index

#2185. (The use of this handpiece will not allow closure of the instrumatic panel.) This situation can be remedied by those desirous of utilizing the above combination by purchasing a *non standard* adaptor kit.

Requisitioners are advised to order a "Midwest Holder Kit," manufactured by the Midwest Manufacturing Company, Melrose Park, Illinois, which will allow the adaptation of this handpiece to the Ritter dental unit. The "Holder Kit" cost $13.95, and the accompanying manual describes installation procedures in drawing #B–472585.

PROFESSIONAL JOURNALS NEEDED

The Naval Dental School needs issues of the Journal of Prosthetic Dentistry from the time it was published up to the present.

If anyone has any of these issues he would donate to the School, please contact the Commanding Officer (Code E4), Naval Dental School, National Naval Medical Center, Bethesda, Maryland 20014.

NURSE CORPS SECTION

TO ALL NURSE CORPS OFFICERS

It is with genuine pride that I extend my greetings and best wishes to all Navy Nurses on the occasion of the Sixty-first Anniversary of the Navy Nurse Corps.

Each year, our anniversary is an occasion for reflection on the accomplishments of our nurses. Both newly commissioned and experienced Nurse Corps officers have contributed greatly to the overall effectiveness of our Corps. The former have rapidly adjusted and accepted great responsibilities in their assignments. The latter have carried the burden of rapid organizational changes as the result of increased patient census. That they were able to maintain high standards of patient care is a tribute to their leadership and dedication to duty.

We are proud of our nurses who serve aboard hospital ships and ashore, often under arduous conditions, in Southeast Asia. The great strides they have made in the area of nursing care of mass casualties has won for them the admiration and gratitude of our fighting men.

In this year 1969, the Navy Nurse Corps continues to move ahead by the individual contributions of professional competence and knowledge so that the military man and his family may receive the best medical care possible. This spirit of unselfishness is truly in the tradition of our illustrious past and makes us proud that we are a vital part of our great Navy.

May the coming year bring you peace and happiness, and the satisfaction of a job well done.

s/Veronica M. Bulshefski
Captain, NC, USN
Director, Navy Nurse Corps

LEADERSHIP ROLE OF THE NEW ENSIGN

The following article was presented at the Navy Nurse Corps Leadership Meeting at the Naval Hospital, Memphis, Tennessee by LTJG Linda Jean Walls, NC USN.

"Throughout the centuries of civilization, leadership, not only in the abstract but also in the concrete experiences of everyday living, has been one of the great mysteries. Definitions have been formulated, but most of them have created indefinable feelings of incompleteness."[1] The question is raised of whether a leader is a leader by virtue of being born into the position or if he develops qualities through the universal potential he possesses which then allow him to function as a leader. Perhaps a third possibility is that the leader is a leader because the role is thrust upon him by the group in which he participates.

Approximately seventy-five percent of the average adult's life is spent in a succession of group efforts.[2] Hence, it is not astonishing to hear the cry for more and better leaders. So it is that nursing is searching for more nurses with leadership ability. Aside from the growth of demand for leaders, other reasons for findings and developing nurse leaders are early marriages, reluctance to try a person out in another position, and the lack of appeal of the leadership position where it is often seen as a negative, fully responsible, authoritarian role.

The new Navy nurse is keenly aware of the leadership role she is about to enter, either voluntarily or involuntarily. She feels some apprehension at leaving the "sheltered fold" where she has been allowed to be both leader and follower, sometimes simultaneously and sometimes concurrently filling these roles. She now looks at the prospect of having to change, in her eyes, to the fully independent leader role. The idea of a solitary, full-time leader on the ward is foreign to her. Nevertheless, again looking at the hypothesis that a leader can be developed as well as born, some consolation is given to the new graduate.

Numerous attempts have been made to define leadership in meaningful terms. After reviewing several definitions of leadership, I see the necessity of establishing individual definitions of leadership to fit each situation encountered. Originally, a leader was considered to be one who showed the way and was followed by others.[3] It is only in recent years that scientific studies of leadership have been conducted, but even so, leadership must be regarded as an art as much as a science. As a science, the results of leadership are more readily seen and understood than the rules of how to become a leader. As an art, leadership is a complex and intricate network of the mental, moral, and physical qualities of the leaders and led alike. Perhaps leadership can be defined in an all-encompassing way by stating that leadership is essentially a process of circular, interpersonal relations.

In the hospital setting, this definition of leadership can be applied also. Generally, the goal in nursing is to provide the patient with comprehensive, individualized, continuity of care. It becomes one of the leader's primary objectives to help her team members establish and work towards this goal for each patient. The team leader finds herself involved in complex interpersonal relationships with her team as well as with her patients as she endeavors to fill this leadership role.

The leader of today is no longer to be looked upon as a unique individual set apart from humanity. Having already responded to the question of born versus developed leadership, I will now discuss some of the primary qualities of a leader. "Leadership may derive many things including knowledge and skill, power, tradition, illusion, intellect, prominence, and personality."[4]

Various qualities are found to be inherent in the definition of leadership as being an interpersonal relationship whereby the leader influences others to act in accomplishing a common goal. Perhaps the most basic quality of the nurse leader is a satisfactory personal and social adjustment between one's self and other people. Herein lies the first problem of the new Ensign—to know herself and personnel as well as patients. The person the nurse *is* is more important than what she actually does. The more the new Ensign has met with and dealt with problems in living and in knowing herself, the more effective her leadership functioning will be.

The new Ensign must be willing to be a follower and to entertain and examine the thoughts of the rest of the ward personnel because in this way an esprit de corps is built and every person is helped to feel that he has an intense personal interest in the success of the group's goals. In fact, one mark of a true leader is the number of leaders she has helped to develop.

Mental abilities and technical knowledge in her field with a capacity and willingness to learn more are essential attributes for the nurse leader. It is extremely important that the nurse develop interests

in other areas besides nursing as this enhances her ability to understand and communicate with her patients and staff. Her increased mental capacity will help her to be flexible and to develop intuitive thought lines. "The successful leader appreciates language as the primary of communication and communication as the primary means of influencing her followers."[5]

The nursing leader must be a professional worker and willing to assume the responsibilities and duties thereof. She must know how to give good care and actually give it as well as teach the corpsmen how to provide maximum comfort for the patients. She is responsible for being a source of motivational strength through her own initiative, industry, and persistence.

Other qualities the leader often possesses are skill in using authority, consistence of behavior, honesty, a sense of humor, and abilities to use the problem-solving method. Ancillary personnel have been questioned in leadership studies about qualities they seek in their nurse leaders. Primarily, the ancillary personnel want the leader to show fairness, thoughtfulness, honesty, proficiency, helpfulness, decisiveness, and interest in the personnel. Ideally, the ancillary personnel can see that true leadership is characterized not by domination, but rather by service.

An interesting summary of the essential qualities of leadership is:

> That (nurse) has what it takes to be a leader who neither short of nor exceeds the standards you have established for leadership in your organization . . .
>
> That (nurse) has what it takes to be a leader who is not disqualified by a shortcoming so serious as to outweigh her positive qualifications . . .
>
> That (nurse) has what it takes to be a leader who is capable of mastering the work under conditions of intensive, accelerated learning . . .
>
> That (nurse) has what it takes to be a leader who evokes an automatic, emphatic yes—response to the question: "Will we be safe in her hands?"[6]

So now, knowing the definition of leadership and at least some of the more essential attributes of leadership, one may question the method of how to become a leader and how to develop leaders, for not only must nursing service be concerned with helping the junior officers become leaders, but also with helping these new officers develop leadership abilities in the corpsmen. Being a leader is a test both of our personal integrity and of our capacity to mature as a personality who increasingly learns to translate his goal values and his ethical aspirations, into his relations with others.[7] Since leadership is a part of a maturing process, the potential for leadership can be developed. One writer has listed what she calls the "Five 'I' Qualities" that will help attract and develop potential leaders: (1) identify the leadership characteristics; (2) interpret the role of a leader; (3) inspire the ambition to become a leader; (4) instruct for leadership; and (5) initiate a climate for leadership.[8]

The characteristics of leadership have already been identified in this discussion. The role of leadership is interpreted through defining leadership as a process whereby goals of nursing service are given over to its personnel by a series of interpersonal relationships. How does one inspire the ambition to become a leader? When the nurse is out of school, the matter of developing leadership becomes an individual responsibility and requires a great deal of self-motivation. Every nurse whether she is the new Ensign or the salty LCDR has the responsibility of being a role model of leadership both for the other nurses as well as for the corpsmen. The ambition to become a leader is contagious when leadership is viewed as a positive factor in nursing. Since leadership abilities come as a result of self-directed efforts, it becomes each nurse's responsibility to examine the characteristics of a leader and compare them with the characteristics she finds in her life. This will tell her how much potential is present and what are her total leadership development needs. Next, the nurse would have to determine which characteristics of leadership she could practically add to her life. Now with a set of objectives in mind, the nurse can set out to develop leadership abilities.

The first conclusion to be reached about the way in which people become leaders is a realization that the setting of the person's activity must be appropriate to encourage leadership into existence. It is the situation and not the person alone, which allows the leader to function. The climate for leadership development must permit people to be genuine in their relationships, insure a warm acceptance and liking for the other person, and foster continuing understanding by others. Somewhat of a permissive climate with free speech is desirable in developing leadership potential. The attitude of the nurse is of prime importance for with a good attitude, the skills and knowledge needed in leadership can be developed. In essence, all development is self-development through establishing a sound attitude.

Conferences, evaluations, inservice education, leadership meetings, and problem-solving workshops are a few of the ways to continue developing leadership potential after graduation. Responsibility for leadership is focused on the professional nurse and cannot be divided among other team members although she will also stimulate them to become leaders.[9] With division of labor and tendencies toward functionalism, only the competent leaders can keep the group committed to the unity of aim which produces the best results. The measure of a nurse leader's success then lies outside of and beyond herself. It lies in effective results at the point where the followers act, and actually depend on the effectiveness of the leader's practice of the art of human relations.

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OCCUPATIONAL MEDICINE SECTION

HEARING CONSERVATION

A STUDY AT MARINE CORPS SUPPLY CENTER, ALBANY, GEORGIA

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The fact that a loud sound could, at least temporarily, affect hearing was realized many years ago. That a significant permanent loss of hearing could result from a prolonged exposure to such a loud sound was demonstrated when man was exposed to the effects of metal forgings, riveting, high horsepower engines, blasting and gum blasts. During this phase of relating loud sounds to hearing, the sound intensities were tremendous and the resulting loss of hearing appeared promptly. In the more recent past, it began to become apparent that prolonged exposure to lower sound intensities, even down to the levels of 85 decibels, could induce a definite permanent loss of hearing. Research into this area revealed that the nerve receptors of the higher frequencies were the most sensitive. That is, the loss in hearing occurred in the higher frequencies first, then slowly progressed down to the lower frequencies. Because the spoken voice is in the lower frequency ranges, a man could lose almost all his hearing abilities in the higher frequencies, but would be unable to detect any loss himself until the progression reached the lower frequencies.

The hazard of high intensity sound was realized by the military in both World Wars I and II and the Korean War, but was oriented only to the every high intensity sounds of combat, heavy machinery and aviation noises. Hearing conservation programs were initiated, but directed only at these extremely loud sounds. With increasing accumulation of evidence that the much lower levels of sound intensities (down to 85 decibels) could have an additive affect on hearing, directives such as BUMEDINST 6260.6A and NCPI 792.5 were issued in 1958. Despite this early concern, adequate and fully preventative measures were hampered by insufficient and inadequate equipment, few personnel properly oriented and trained in this aspect of Industrial Medicine and poor reception by the affected persons due to the nonexistence of an organized training or educational program. However, some response to combat this hazard was made, but has been almost negated by a progressive increase in the average level of sound intensity in industry due to the absence of consideration of the amount of hazardous sound created by new tools, new machinery, new techniques and new installations.

In January 1968, the Marine Corps issued Marine Corps Order 6260.6 to emphasize the need of a renewed interest in hearing conservation. With receipt of this order, this Center initiated a self-evaluation program of the existing Hearing Conservation Program. In February 1968, the Center Safety Officer reevaluated sound levels throughout the

Center, testing only the "A" band of frequencies. In the two-year interval since the prior testing, the sound intensity levels had increased so rapidly that approximately 870 persons, rather than the previously determined 200, were being exposed to hazardous level of sound intensities aboard the entire Center. It is to be noted that the extent and care exercised in the survey of 1968 exceed that expended in the previous surveys. Routine preemployment audiograms had not been instituted until September 1967. Prior interpretations of annual follow-up audiograms in the Hearing Conservation Program had been directed only towards documenting significant losses in the lower frequency ranges. Educational and training programs in the recognition of hazardous sound conditions and the proper use of hearing protective devices were minimal.

The Repair Division of the Marine Corps Supply Center is a complete industrial complex and was selected for an intensive study of current hearing conservation effectiveness because of the following facts.

1. The sound intensity survey of February 1968 clearly demonstrated that the levels of sound intensity were increasing rapidly.

2. The circumstance that, for at least two years, a portion of the personnel exposed to basically the same intensity and character of hazardous sounds were under an organized Hearing Conservation Program, but the remainder were unprotected. This circumstance represents an excellent basis for a comparative study of pre-existing hearing conservation methods.

3. Nearly all the persons now being exposed to hazardous sound intensities had no such exposure prior to their employment in this complex.

4. The work force at this complex is relatively stable, thus permitting future comparative studies.

With these qualifying bases for a study, a survey of all the personnel of the Repair Division was begun on 1 May 1968 and concluded on 30 August 1968. Such a complete survey was considered mandatory for the following reasons.

1. To establish a current baseline audiogram for all personnel despite their length of employment or degree of exposure to hazardous sound.

2. To evaluate the effectiveness of the pre-existing hearing conservation programs.

3. To document the type and degree of any auditory damage existing in personnel.

Two systems were devised to objectively evaluate and process the data obtained from this survey. Since the length of time exposure to hazardous sound is one of the relevant factors to be considered, the following coding system was designated and the personnel coded accordingly by their immediate supervisors.

1. Group A—Exposure to sound intensity above 90 decibels 24 to 40 hours a week
2. Group B—Exposure to sound intensity above 90 decibels 3 to 23 hours a week
3. Group C—Exposure to sound intensity above 90 decibels 0 to 3 hours a week
4. Group D—Exposure to sound intensity above 90 decibels zero hours a week

An objective, rather than a subjective, system of audiogram evaluation was mandatory for comparison. The decibel loss as to eligibility to be assigned to or continue employment in hazardous sound areas are quite specific numerical values as dictated in BUMEDINST 6260.6A, NCPI 792.5 and MCO 6260.1. To encompass all these criteria within a computable data element, an audiogram coding system was devised. This devised data element consist of three basic components. The first component refers to the audiometric testing frequencies 500, 1000, and 2000, and consists of three positions. The first position identifies the frequency component by the letter A. The second component consists of three positions and refers to the audiometric testing frequencies of 300, 4000, and 6000. The first position of this element is identified by the letter B. The third component consists of one position and indicates the next course of action by a Roman numeral as follows.

I—Not acceptable for employment in sound levels above 85 decibels.
II—Repeat audiogram immediately.
III—Repeat audiogram one month.
IV—Repeat audiogram three months.
V—Repeat audiogram six months.
VI—Repeat audiogram twelve months.

The second position of both of the two frequency components state the loss in decibels according to International Standards Organization (ISO) calibration as follows.

1—Not exceeding 25 decibels
2—Not exceeding age allowance (25 decibels plus 0.5% loss for each year above age 50)
3—25 to 30 decibels
4—30 to 50 decibels
5—50 to 70 decibels
6—Exceeding 70 decibels

The third position of each frequency component states the amount of change since the previous audiogram as follows.

a—0 to 5 decibels
b—5 to 15 decibels
c—15 to 20 decibels
d—exceeds 20 decibels

Thus, an audiogram that reveals an average loss in both ears of less than 25 decibels in the testing frequency range 500, 1000, and 200 with no change since the prior audiogram, an average loss in both ears of 30 to 50 decibels in the testing frequency range 3000, 4000, and 6000 with a change of 10 decibels since the prior audiogram and need not be repeated for one year would be coded A1aB4bVI.

The personnel who had been incorporated in an active Hearing Conservation Program in the Repair Division consisted of 95 persons employed in weapons repair and testing, engine dynamometer testing and welding. Their immediate supervisors classified them to exposure Group A—65 and exposure Group B—30. The remaining 915 employees tested during the survey were considered as having been under no effective hearing conservation program and classification into sound exposure groups Group C—181 and Group D—143. This gives a total of 1010 audiograms in this survey.

Certain factors other than the intensity of sound and the total duration of exposure to hazardous sound can affect hearing loss. It should be noted that the intensity of sound was only oriented to that above 90 decibels, so that any multiplying affects by increments above 90 decibels (that is, 100, 110, 120, etc.) will not be reflected in the obtained data.

Repeated acute and/or chronic middle ear infections can cause significant hearing losses, but less than 2% gave a history, on direct inquiry, of such a disease. It is believed that such a small group will not significantly alter the statistical importance of the results. The total duration of exposure to hazardous sound was reflected by a cumulative representation of the exposure groups and total length of employment.

One statistical qualification of the data must be made prior to presentation. Theoretically, exposure Group D should represent "normal," but approximately 10% of this group represents supervisors who had definite exposure to hazardous sound in the initial portions of their careers. Thus, the significant hearing losses in exposure Group D, especially in the total employment ranges of 5 to 25 years is not statistically significant.

It is also noteworthy that questionable audiograms were encountered and were repeated one to three times until they were considered to be a true reflection of hearing rather than that of apprehension, confusion concerning instructions or total lack of attention. Causes for rejection were abrupt changes in the tracings, significant losses in test frequencies 500, 1000, and 200, with no losses in test frequencies 3000, 4000, and 6000, or less than three fluctuations of the recording tracings within any one test frequency.

With these explanations and qualifications, the following tabulations of obtained data are presented.

CHART I

CURRENT AUDIOGRAMS OF PERSONNEL PREVIOUSLY INCORPORATED IN THE HEARING CONSERVATION PROGRAM

EXPOSURE GROUP A—65

Years of Employment	Test Freq 500, 1000, 2000 Loss 0–30 Decibels	Loss Over 30 Decibels	% Detrimental Loss of Entire Group
0–1	0	0	—
1–3	17	3	15
3–5	5	0	—
5–10	16	2	11
10–15	14	5	26
15–25	2	1	33
	54	11	

Years of Employment	Test Freq 3000, 4000, 6000 Loss 0–50 Decibels	Loss Over 50 Decibels	% Detrimental Loss of Entire Group
0–1	0	0	—
1–3	15	5	25
3–5	5	0	—
5–10	12	6	33
10–15	12	7	37
15–25	2	1	33

EXPOSURE GROUP B—30

Years of Employment	Test Freq 500, 1000, 2000 Loss 0–30 Decibels	Loss Over 30 Decibels	% Detrimental Loss of Entire Group
0–1	0	0	—
1–3	4	0	—
3–5	9	0	—
5–10	7	1	12.5
10–15	4	1	20
15–25	3	1	25
	27	3	

Years of Employment	Test Freq 3000, 4000, 6000 Loss 0–50 Decibels	Loss Over 50 Decibels	% Detrimental Loss of Entire Group
0–1	0	0	—
1–3	3	1	25
3–5	8	1	12.5
5–10	7	1	12.5
10–15	3	2	40
15–25	2	2	50

CHART II

CURRENT AUDIOGRAMS OF ADDITIONAL SOUND HAZARD PERSONNEL AS OF 1968

EXPOSURE GROUP A—160

Years of Employment	Test Freq 500, 1000, 2000 Loss 0–30 Decibels	Loss Over 30 Decibels	% Detrimental Loss of Entire Group
0–1	4	1	20
1–3	43	3	7
3–5	5	0	—
5–10	30	4	12
10–15	41	13	24
15–25	11	5	31
	134	26	

Years of Employment	Test Freq 3000, 4000, 6000 Loss 0–50 Decibels	Loss Over 50 Decibels	% Detrimental Loss of Entire Group
0–1	3	2	40
1–3	32	14	30
3–5	3	2	40
5–10	23	11	32
10–15	38	16	30
15–25	11	5	31

EXPOSURE GROUP B—431

Years of Employment	Test Freq 500, 1000, 2000 Loss 0–30 Decibels	Loss Over 30 Decibels	% Detrimental Loss of Entire Group
0–1	7	1	12.5
1–3	91	6	6
3–5	33	1	3
5–10	93	13	12
10–15	132	12	9
15–25	38	4	10
	394	37	

Years of Employment	Test Freq 3000, 4000, 6000 Loss 0–50 Decibels	Loss Over 50 Decibels	% Detrimental Loss of Entire Group
0–1	7	1	12.5
1–3	77	20	20
3–5	31	3	9
5–10	73	33	32
10–15	106	38	26
15–25	34	8	20

EXPOSURE GROUP C—181

Years of Employment	Test Freq 500, 1000, 2000 Loss 0–30 Decibels	Loss Over 30 Decibels	% Detrimental Loss of Entire Group
0–1	7	0	—
1–3	33	2	6
3–5	8	1	11
5–10	44	4	9
10–15	56	10	15
15–25	11	5	30
	159	22	

Years of Employment	Test Freq 3000, 4000, 6000 Loss 0–50 Decibels	Loss Over 50 Decibels	% Detrimental Loss of Entire Group
0–1	7	0	—
1–3	23	12	32
3–5	8	1	11
5–10	41	7	15
10–15	49	17	25
15–25	9	7	44

EXPOSURE GROUP D—143

Years of Employment	Test Freq 500, 1000, 2000 Loss 0–30 Decibels	Loss Over 30 Decibels	% Detrimental Loss of Entire Group
0–1	10	0	—
1–3	30	1	37
3–5	12	0	—
5–10	29	2	77
10–15	39	6	13
15–25	13	1	7
	133	10	

Years of Employment	Test Freq 3000, 4000, 6000 Loss 0–50 Decibels	Loss Over 50 Decibels	% Detrimental Loss of Entire Group
0–1	10	0	—
1–3	27	4	13
3–5	8	4	33
5–10	27	4	13
10–15	37	8	18
15–25	10	4	30

In summary, the following conclusions are made.

1. A significant number of persons exposed to hazardous sound intensities have sustained detrimental to disqualifying hearing losses.

2. Initial hearing losses due to exposure to hazardous sound intensities occur initially in the higher frequencies.

3. Hearing losses are directly proportional to the total length of exposure and to the intensity level of sound.

4. Some persons are "hearing loss prone"—that is, they sustain a greater loss of hearing from equal periods of exposure to an equal intensity of sound.

5. The preexisting Hearing Conservation Program has not been effective in reducing hearing losses.

SHIPYARD INDUSTRY REGULATIONS IN NEW PAMPHLETS

Joseph LaRocca, Bureau of Labor Standards, Safety Standards 18(1):10–11, Jan-Feb 1969.

During the past 3 years, extensive changes and additions have been made in the shipbuilding, shipbreaking, and ship repair safety regulations issued by the Bureau of Labor Standards under the provisions of the Longshoremen's and Harbor Workers' Compensation Act. As a result, pamphlets containing the regulations have been revised and reissued, containing all changes in the regulations through July 15, 1968.

Over the 8 years the regulations have been in force, the disabling injury-frequency rate in the shipyard industries has dropped about 38 percent, and the severity rate by about 46 percent. Still, these industries' rates are considerably above the national industrial injury levels, and the Bureau, employers, and workers must continue efforts to further reduce injuries.

Changes in these regulations are generally based on the accident experience in the industries, observations of Bureau maritime safety officers, and the recommendations of management and labor. Each Bureau-developed proposal was first distributed for informal comment, and then published in the Federal Register for public comment. To assure the widest possible response, the Bureau sent copies of the pertinent sections of the Register to management and labor officials in the industry, and to other government agencies with related interests. Hearings were held for the presentation of oral and written comment on each proposal, and to obtain other recommendations of interested parties. After a review of all comments, the Secretary of Labor issued the new and revised regulations.

Among the more important changes and additions were:

Broadened responsibility for the "competent person." Internal combustion engines, either fixed or on mobile equipment, are more frequently being used in below-decks shipyard operations. Where mobile equipment is in use, the atmosphere in the space must be frequently tested for carbon monoxide. The "competent person" must perform these tests as often as may be required to assure that the CO level does not exceed the allowable 50 parts per million parts of air.

Testing and inspection for toxic contaminants. In spaces where toxic, corrosive, or irritant liquids, gases, or solids have been carried, tests are required before initial entry of employees is allowed. The tests shall be performed by marine chemists, industrial hygienists, or other persons qualified to make these determinations.

Use of explosion-proof extension lights. When tanks or spaces have been certified as "Safe for Men," approved explosion-proof extension lights operating at line voltage may be used in lieu of battery powered lamps. Suitable extension lights must be approved by Underwriters' Laboratories, Inc., U.S. Bureau of Mines, or the U.S. Coast Guard for use in Class I, Group D atmospheres.

Emergency shutoff in abrasive blasting. Abrasive shutoff may be accomplished in two ways. A direct acting fail-safe control may be provided so that if the blaster releases his grip on the deadman control at the nozzle, the flow of abrasive will automatically be shut off at the pot. Alternatively, a mechanism at the nozzle may visually and aurally signal the pot-tender, who in turn will shut off the flow.

Improper uses of oxygen. A significant number of accidents have resulted from improper use of

oxygen. The following unsafe uses of oxygen are therefore specifically prohibited: ventilating spaces, comfort cooling, blowing dust or dirt from clothing, or cleaning work areas. Good practice dictates that industrial oxygen should be used only for authorized burning and welding processes.

Instruction of fire watchmen. To help fire watchmen improve the performance of their assigned tasks, the employer must provide them with sufficient and proper instructions on the specific anticipated fire hazards, and how the firefighting equipment is to be used.

Capping of gas outlets. Caps are required on manifold and header valves of oxygen and fuel gas systems. The purpose of the caps is to protect the threads from damage and thus prevent leakage when hoses are coupled on. The caps also prevent entry of foreign matter into the open ends of the valve connections which may cause leaky connections or flashbacks.

Restrictions on fiber back rails for scaffolds. Slag and hot metal droppings from welding and burning operations char and weaken fiber back rails, making them unserviceable. Chemicals may produce similar results. Therefore, fiber back rails may not be used where they may be exposed to hot debris from welding or burning or to chemicals.

Guarding exposed edges. The requirements for guarding exposed edges have been extended beyond scaffolding and guarding low hatchways and deck openings. Any open edge of a deck, flat, or platform more than 5 feet above a solid surface, and open sections of bilges, walkways, catwalks, and gratings must be properly fenced to prevent workmen from falling off.

Catwalks on marine railway stiles. Catwalks must be at least 20 inches wide, and provided with an adequate back rail on at least one side. These requirements will provide a substantial walkway for workers operating winching devices for working keel blocks.

Safety in elevated work. Rules governing work aloft have been recast to also cover any work at a substantial elevation. Where work must be performed more than 5 feet above a solid surface, the work must be done from a scaffold or a sloping ladder; or the worker must be protected by a safety belt and lifeline. If the worker is visually restricted, as by a blaster's hood or welding or burning goggles, the work may be done only from a scaffold. A partial exemption from this last requirement is permitted for brief nonrepetitive jobs, such as initial setup or dismantling of hung scaffolding. These short-order jobs may be done from a sloping ladder.

Buoyant work vest rules extended. Under previous rules, workers on small boats or floats were required to wear Coast Guard approved buoyant work vests only while actually working on the boat or float. The rules now require that the work vest be worn while boarding or leaving the boat or float. This change was made because of several cases of men falling into the water while boarding or leaving.

Infrared heat lamps. To minimize the possibility of contact with the hot surfaces of such lamps, all surfaces except the face must be protected with guards.

Control of hazardous materials. The increasing use of a wide variety of chemical materials in shipyards has produced a serious potential for accident and injury. This potential, coupled with injuries that have occurred, has demonstrated the need for a new regulation requiring the employer to ascertain the potential fire and toxic hazards which may be encountered.

To aid employers in obtaining the necessary information, the Bureau is working with trade organizations, such as the National Paint, Varnish, and Lacquer Association, the Manufacturing Chemists' Association, and the Shipbuilders' Council of America, to develop a useful hazardous materials data sheet. This form, or one essentially similar to it, can be used by the manufacturer of chemical materials to furnish the buyer or user with the appropriate information to enable him to exercise the proper controls. The items of information to be supplied in the data sheet will be published in the Federal Register in the near future.

Liners for Stokes litter. Stokes or basket litters must have a blanket or liner, to facilitate easy transfer of patient between the litter and a stretcher.

Certifying cranes and derrick barges. Cranes and derricks directly under the jurisdiction of the Bureau of Labor Standards must be certified in accordance with Part 1505 of the regulations, which has provisions similar to the certification requirements of the Longshore Safety and Health Regulations. Included under these new certification regulations are crane and derrick barges, mobile cranes and derricks used on board a vessel, and cranes and derricks located on the wingwalls of a floating drydock.

Driveguards. Adequate guards must be provided on the drive mechanisms of heavy tools, such as engine crankshaft turners, cylinder grinders, honing machines, and stern tube boring bars.

Marking air headers. Manifolds, groups of valves on a header, and single valves at various locations in any compressed air system must be marked

clearly with the word "AIR," in letters not less than 1 inch high.

Double insulated electrical tools. Electrical tools approved by Underwriters' Laboratories, Inc., as conforming to the double-insulation requirements of the National Electrical Code (USA Standard C–1 or National Fire Protection Association, NFPA 70) may now be used without grounding. Noncurrent carrying metallic parts of electrical tools not meeting this requirement must still be properly grounded.

Grinder guards. Cup-type grinding wheels must be protected in accordance with the provisions of the USA Standard B7.1 "Safety Code for the Use, Care and Protection of Abrasive Wheels."

Working on welded pipe systems. Regulations require that valves in hot fluid systems (steam, oil, or water) be blanked off in addition to shutting and tagging the valves which isolate a part of the system for work. However, in a pipe system where the valves are welded, it is not practical to cut out the valves in order to blank them. In this case, the regulations permit locking and tagging of valves only, provided, where possible, that at least two valves between the live section and the work section are secured, locked, and tagged. The drain valves of the dead sections must also be opened and visually observed to assure that the hot fluid actually has drained.

Testing deenergized electrical circuits. Several accidents have occurred because an electrician assumed that an electrical circuit had been deenergized, when, in fact, it had not. A test must now be performed at the workplace to determine whether or not the circuit is dead at that point.

NOISE

SOUND WITHOUT VALUE

Safety Standards 18(1):3–7, Jan–Feb 1969.

Occupational Noise—The Present Situation

Noise-induced hearing loss looms as a major health hazard in American industry. Noise surveys in assorted industries have revealed that a multitude of machines generate noise levels believed potentially harmful to hearing. Audiometric studies have shown that noise-exposed factory workers usually have poorer hearing than groups with minimum occupational noise exposures; e.g. office workers. The number of United States workers experiencing noise conditions unsafe to hearing is estimated to be in excess of 6 million and may be as high as 16 million. With some exceptions, verification of the prevalence of hearing loss in different occupations has been difficult owing to management's fears that such tests might precipitate an avalanche of compensation claims. Unions have not pressured for such surveys either.

Major industries where significant noise-hearing loss hazards exist or are suspected include iron and steel making, motor vehicle production, textile manufacturing, paper making, metal products fabrication, printing and publishing, heavy construction, lumbering and wood products and mechanized farming. Specific armed services occupations which can be added to this group include flight line and carrier deck operations, engine test cell and weapons firing, armor operations and assorted repair and maintenance work.

Recognition of the noise-hearing loss problem has prompted research aimed at defining noise exposure criteria for safeguarding hearing. Numerous proposals for safe noise exposure exist, some of which have been incorporated in the occupational health regulations of a few States. Further adoption of such criteria is frustrated by discrepancies in the noise limits proposed, and the fact that existing data permit only "tentative" noise-hazard judgments for certain type of occupational exposures; e.g., impact noise, narrow-band noise, and intermittent noise. Despite numerous efforts by professional standards and criteria committees, e.g., United States of America Standards Institute, a national hearing conservation standard governing allowable or safe exposures remains to be established.

The differences in proposed noise exposure reflect, in part, differences in protection goals. How much of the exposed population should be protected? How much hearing ability should a criterion be designed to protect? Bearing on these issues, the relationships between levels of noise exposure and incidence of hearing impairment in various worker

groups are being formulated to identify the risks associated with different proposed noise standards for hearing conservation. Hearing impairment is defined in these formulations as losses which cause difficulty in everyday speech reception. All noise criteria are designed to minimize losses at sound frequencies essential to understanding speech, but there is some question as to what constitutes the "critical speech frequencies." Manifestations of the latter controversy also occur in compensation formulae used to appraise disability claims for industrial hearing loss.

Aside from hearing loss, noise may cause cardiovascular, glandular, respiratory, and neurologic changes, all of which are suggestive of a general stress reaction. These physiologic changes are produced typically by intense sounds of sudden onset, but also can occur under sustained high level, or even moderately strong, noise condition. Whether such reactions have pathologic consequences are not really known and may be unlikely in view of the body's capacity to adapt to prolonged or recurring forms of sound stimulation including those of fairly high level. However, there are growing indications, mainly in the foreign scientific literature, that routine exposures to intense industrial noise may lead to chronic physiologic disturbances. A German study, for example, has shown a high incidence of abnormal heart rhythms in steel workers exposed to high noise level in their workplaces. Neurological examinations of Italian weavers, also exposed daily to intense noise, have shown their reflexes to be hyperactive, and, in a few cases, electroencephalography has revealed a pattern of desynchronization as seen in personality disorders.

A study reported in the Russian literature shows that workers in noisy ball-bearing and steel plants have a high incidence of cardiovascular irregularities such as bradycardia. Subjective complaints of extreme fatigue, irritability, insomnia, impaired tactile function, and sexual impotence also have been made by workers repeatedly exposed to high level industrial noise. All of these disturbances appear marginal in nature and may be difficult to relate causally to noise. Other factors in the work situation or in the specific group under study might have been responsible for the observed problems. In any case, corroboration of these findings is needed and a broad-scale survey of nonauditory disorders among workers in noisy industries might prove illuminating.

Noisy conditions in work areas can interfere with speech reception and impair worker performance on jobs requiring reliable voice communication. Noise effects on performance, not dependent on voice communication, are uncertain. Available information suggests that workers devoting constant attention to detail (e.g., quality inspection, console monitoring) may be most prone to distraction. Noise may mask auditory warning signals and thereby cause accidents or generate reactions of annoyance and general fatigue. With reference to the latter, it has been stated that man must work harder under noisy conditions than in quiet to attain the same job output. The fact that much of these data are conjectural demonstrates that additional research is needed to determine their validity.

Data coupling industrial noise conditions with measures of accident rate, absenteeism, and employee turnover are not available. Noise may be implicated in such occupational problems but casual relationships might be difficult to demonstrate. It should be stressed that reducing industrial noise conditions to levels nonhazardous to hearing will minimize but not eliminate the performance-behavior problems just described. Clearly, there is need for additional basic research to determine the full spectrum of the effects of human exposure to a noisy environment.

Economic Aspects

The potential cost of compensation for industrial hearing loss is alarmingly large. One estimate is $450 million which assumes that only 10 percent of those eligible for hearing loss compensation will file a claim and that the average award per claim is $1,000. In actuality, hearing loss awards average $2,000. While more and more hearing loss claims are being processed each year, the total number is still relatively small. Indications are that fewer than 500 cases were settled in 1966.

There are various reasons for the small number of claims. Many afflicted workers do not know that their hearing loss is compensable. Compensation laws in some States honor claims for total deafness but not partial loss of hearing, the usual result of excessive occupational noise exposure. Workmen's compensation provisions in other States cover partial loss of hearing due to noise but require the claimant to be 6 months away from the job before settlement can take place. Incidentally, a comparison of State laws covering industrial hearing loss presents a confusing picture which is best illustrated by differences in the amount of benefits received for such disablements. For example, Michigan grants a maximum award of $28,500 for total loss of hearing in both ears, while Nebraska awards only $3,700 for the same case.

Reflecting to some extent noise-hearing loss problems in the military, the Veterans' Administration spends $65 million annually in rehabilitation programs for 90,000 war veterans with service-connected hearing disorders. The Bureau of Employees' Compensation indicated that no noise-induced deafness claims were awarded to Department of Defense employees in 1966. No figures were obtained for possible awards to employees of other Departments.

Government noise control-hearing conservation efforts conducted primarily in the Department of Defense cost $2 million annually. Such funds cover purchase of ear protector and audiometric and related test equipment. Not included are the salaries of medical technicians at almost every military installation who give hearing tests and run hearing conservation programs.

The cost of controlling noise hazards in industry is difficult to compute. In one company, noise control programs utilizing preplacement and periodic audiometric examinations plus personal ear protection cost about $2 per worker annually. Taking the lower estimate of 6 million workers exposed to unsafe noise conditions, it would require $12 million yearly to provide this population with hearing conservation measures. For several reasons, the number of workers covered by these types of programs is believed to be quite small. For example, small factories which employ over 80 percent of the total work force lack the medical safety staffs usually needed for successful program implementation. Further, personal ear protection programs as a means of controlling hearing damage by industrial noise have had a high mortality rate because of negative worker and management attitudes. Improving source/path noise control techniques are a more positive remedy but are also more expensive. Estimated costs for engineering noise control in one industry average $26 per decibel reduction per employee. That is, reducing the noise level by 10 decibels in a work area of 100 people would cost 10X100X$26 or $26,000. Actually, the cost of engineering noise control could be decreased significantly if such provisions were made in the early planning stages of plant layout or in the design of industrial machinery. Needed modifications at this point would not be expected to exceed 5 percent of the total development cost.

Current Programs

Federal activities concerned with occupational noise problems and their control can be classified into research, training, and regulatory areas.

Research—Air Force, Army, and Navy agencies in the Department of Defense spend approximately $2.5 million annually in support of in-house and contract research projects bearing on occupational noise problems. The in-house research is conducted at six major bioacoustic laboratories, each with 8 to 12 staff people engaged in relevant projects.

Studies of noise-induced hearing loss at these installations have furnished the basis for hearing conservation criteria now used in service preventive medicine and safety programs. A significant portion of this work also has been directed to noise effects on speech communication and on nonauditory behavioral and physiological functions deemed critical to combat performance. The applicability of this latter research to nonmilitary or normal work situations may be limited since the conditions under test involve unusual noise exposures and novel tasks.

Testing and evaluation of assorted ear protective devices, once an active pursuit of the Armed Forces laboratories, have been deemphasized. Current interest in this area seems directed solely toward the development of better noise exclusion features in special purpose military headgear.

Department of Health, Education, and Welfare programs having relevance to industrial noise problems and their control are directed by various elements of the Public Health Service. Grants and contracts for noise research amount to $800,000 per year. With few exceptions, these projects have dealt with noise-hearing loss problems such as identification of factors underlying susceptibility, aspects of aural reflex protection against excess noise, impact noise effects on hearing, and mechanisms of noise-induced deafness.

In-house research in the Public Health Service has been performed largely at a noise laboratory in the National Center for Urban and Industrial Health. This laboratory has developed and is currently attempting to implement a program concerned with noise effects on overall health, productivity, and well-being, and aspects of environmental noise control. Presently, the laboratory has a staff of eight people and an operating budget of $150,000 per year.

The Federal Aviation Agency in the Department of Transportation has studied cockpit noise problems which might affect the hearing of pilots, and has also investigated fatiguing aspects of noise. National Bureau of Standards personnel have been engaged in developing standard acoustic measurement procedures and establishing specifications for noise measuring instruments.

As a point of interest, the Department of Defense, the Federal Aviation Agency, and the National Aeronautics and Space Administration are sponsors of a National Research Council Committee on Hearing, Bioacoustics, and Biomechanics, referred to as CHABA. The committee, composed of acoustic and noise control experts, gives direction and advice toward the solution of acoustic problems submitted by their sponsoring agencies. CHABA has offered guidelines for hazardous noise exposure, and prescribed standard procedures for hearing testing in the Armed Forces. The Department of Health, Education, and Welfare and Housing and Urban Development are affiliated with CHABA but are not sponsoring members.

Training—The Air Force, Army, and Navy Medical Services each conduct in-service training courses for personnel who will be responsible for environmental control problems. Such courses run from 2 weeks to a year with 10 percent of the time devoted to environmental and occupational noise problems encountered in military or defense operations. The three armed services also support graduate programs leading to M.S. and Ph.D. degrees which include courses in occupational noise.

The training permits the three medical services to maintain a staff of about 300 industrial hygienists and bioenvironmental engineers. These individuals monitor hearing conservation programs, perform sound surveys for hazardous and speech interference noises, and review the environmental health aspects of construction drawings.

As part of its training activities, the Public Health Service offers 1-week courses on industrial noise and its control once every 2 years, and on request, holds regional or State 2- to 3-day conferences on the topic. Lectures on noise are offered three times a year. The classes are composed largely of State health and safety personnel with responsibility for environmental problems. Service personnel and individuals from medical safety departments in various industries are also enrolled.

Noise guides and handbooks, together with individual laboratory and field research reports, have been prepared and published by the Department of Health, Education, and Welfare and the Department of Defense to serve as source materials for coping with problems of noise control in industry and other environments. However, field demonstrations illustrating effective noise control principles are lacking as are educational activities designed to educate the average worker about the ills of excessive noise exposure.

Regulations—The Walsh-Healey Public Contracts Act contains safety and health regulations which must be met by private contractors holding Government contracts in excess of $10,000. Under this act, the Federal Government can require industries to abate excessive noise as well as other occupational health hazards. Unfortunately, the current regulations make only vague reference to noise problems. The need for strengthening the noise control provisions in this act has been recognized, and some suggestions have come under consideration.

The Army, Navy, and Air Force have established regulations to minimize the adverse effects of noise on service personnel. These regulations specify noise exposure limits which take account of spectra and duration factors. In addition, the regulations require educational programs to provide information about noise hazards; issuance of personal ear protectors; identification of areas having harmful noise levels; and preplacement and monitoring audiometry. The latter practice enables personnel with preexisting losses to be assigned to non-noisy areas and also serves to detect individuals unusually susceptible to noise-induced loss. The Air Force and Army give over 200,000 audiometric tests each year related to the hazardous noise control programs. A proportional number of audiograms are also performed by the Navy. All recruits entering the Armed Forces are now given audiometric exams.

Hearing conservation directives have been issued by the Federal Aviation Agency and the National Aeronautics and Space Administration. These directives contain provisions similar to those of the three military services but differ in their hazard rating procedures for short term or intermittent noise conditions.

In the case of Federal employees, the Bureau of Employees' Compensation includes provisions for covering partial or total loss of hearing due to occupational noise exposure. One of the factors used in awarding compensation claims is a formula which weights hearing sensitivity at various frequencies according to their assumed importance in the hearing and understanding of speech.

Recommended Federal Actions

In summary, despite recognition of occupational noise problems and varied efforts at control, there are evident shortcomings in our present knowledge and programs in this area. Gaps remain in identifying assorted noise effects on the worker, and procedures for rating noise hazards and their disabling consequences lack validity, uniformity, and accept-

ance. While well intended, existing regulations to control noise have inherent weaknesses which must be overcome. Indeed, additional and more intensified activities are basic to accomplishing the goal of providing workplaces free of noise hazards to the American worker.

The following recommendations were proposed to attain this objective (excerpted list).

Recommendation 1

The Department of Health, Education, and Welfare should conduct a systematic research program concerned with the identification and elaboration of the effects of noise on man's hearing, physical and mental health, and work productivity to develop health criteria for use in setting standards for human exposure to noise.

The Department also should increase its in-house competence to conduct research on human response to noise to provide information needed in this area by other agencies in their programs. However, the National Aeronautics and Space Administration should complete its current community response studies in relation to airport noise. The Department of Housing and Urban Development should conduct research on economic effects of noise and its abatement within the urban environment, and undertake studies on collective community responses to noise. In addition, this Department should develop guidelines and methods needed to hold noise to an acceptable level through the employment of site planning, land use, or similar abatement measures.

Recommendation 3

The Department of Commerce in order to provide the data, techniques and methods necessary for the establishment of acoustical criteria and performance requirements, should undertake a research program to (a) develop standardized methods for measuring the acoustical properties and noise transmission characteristics of building materials and structures, and (b) develop noise control measures for industrial machinery, utilities, equipment, and appliances leading to the establishment of criteria and performance requirements. The National Bureau of Standards should construct an architectural acoustics laboratory and test facility to support this research program. This facility should be available to other agencies for pertinent aspects of their programs.

Recommendation 6

The Department of Labor and the Department of the Interior should establish and enforce noise standards to safeguard physical and mental health with particular regard to hearing loss, in the industrial and commercial work situations under their jurisdictions. All Federal agencies should establish similar standards for their own employees.

Recommendations 11

The Department of Commerce and the Department of Housing and Urban Development should jointly develop guidelines for setting standards for uniform sound insulation and noise control for buildings for use by standard setting organizations, particularly governments that establish building and noise control ordinances. Similar guidelines should be developed by the Department of Commerce for noise control of machinery, equipment, and appliances.

Federal agencies should adopt these guidelines in the purchase of machinery and equipment, and in the design and construction of buildings. In addition, the Department of Commerce should provide technical assistance to manufacturers and develop criteria to abate current or anticipated industrial noise problems in interstate commerce.

Recommendation 13

The agencies responsible for the various segments of the noise problem outlined above should survey their needs for trained personnel and expand their educational programs to meet those needs.

Recommendation 14

To develop and implement a total national program to abate undesirable noise, the operations of agencies responsible for segments of the program should be coordinated to assure (1) that the activities of the agencies are complementary, and (2) that exchanges of technical information and cooperation are facilitated.

Legislation already enacted, existing competence in the various program elements in different agencies, and the logical association of noise control measures with present agency missions make the assignment of the entire program to a single department undesirable.

Specific administrative and procedural arrangements should be expanded or developed by the agencies involved to insure complementarity of the various program elements.

To facilitate technical cooperation and information exchange those agencies with mission responsibilities; should sponsor periodic conferences to review progress and plans related to technical aspects of the noise program.

In this regard the work of the Interagency Aircraft Noise Abatement Program should be examined to see how its program should be integrated with other noise abatement efforts.

QUESTION CLINIC

Charles P. Giel, MD, Dept Editor, JOM 10(12):710, Dec 1968.

Milk Myth

Question: Is there any scientific foundation for the theory that the drinking of milk by welders is a health precaution relating either to respiratory or other health hazard?

—Attorney, New York City

Answer: There is no scientific evidence that the drinking of milk provides welders with any degree of protection against respiratory or other systemic diseases due to the inhalation of excessive amounts of welding fumes.

The origin of this legend is difficult to trace. It probably arose from the belief that milk protected against or at least delayed the onset of lead poisoning. Inasmuch as burning or cutting steel protected with lead based paint was a known lead hazard, it was incorrectly assumed that milk would protect the burners or cutters against lead poisoning. Kehoe and his associates at the University of Cincinnati conclusively demonstrated however, that the absorption and elimination of lead by the body is not affected by the addition of large quantities of milk to the normal diet.

Inasmuch as the practice may give rise to a false sense of security on the part of welders and thereby encourage them to discard protective devices and disregard safe working procedures, furnishing milk to welders, as a health measure, should be discouraged.

—Committee on Industrial Medical Practice, Industrial Medical Assoc.

EDITOR'S SECTION

MEETING OF THE SOCIETY OF MILITARY ORTHOPEDIC SURGEONS

The Society of Military Orthopedic Surgeons (S.O.M.O.S.) will hold its eleventh meeting at the National Naval Medical Center, Bethesda, Maryland 20014, on 22 through 24 September 1969.

Professional papers are requested for presentation at this meeting and further inquiries may be addressed to Captain Robert H. Brown, MC USN, Naval Hospital, Bethesda, Maryland 20014.

Reserve Officers are invited and may apply for this meeting via their district command.

BUMED NEUROPSYCHIATRY MOVIES

A series of movies on subjects varying from Drug Abuse, Personnel Effectiveness, Reliability and Leadership, to Preventive Psychiatry and Out-Patient Treatment have been developed by the Neuropsychiatry Branch in cooperation with the Audio-Visual Training Branch of this Bureau and of the Navy Medical School. In addition, a number of movies have been produced which deal with personality types who tend to be unpredictable, inept or indirectly or directly to interfere with their own adjustment and their relations with other people. Hence these individuals can adversely affect the reliability, operational effectiveness and performance of the Navy.

One of the most recent movies "Trip To Where" (MN–10494) is being widely utilized in the Navy, the other Armed Services, other Governmental Agencies, and in the civilian community. It has been acclaimed and endorsed by such organizations as the American Medical Association, the American Psychiatry Association and the American Pharmaceutical Association, among others. It has been and is being shown to police, school, church and other audiences across the country. The use of these drugs such as LSD and more recently barbiturates, amphetamines, and even raw opium, are adversely influencing the crime rate in various and at times rather insidious ways. This movie has had a positive effect in educating both military and civilian audiences and thereby decreasing drug misuse. This is particularly important in that many of our potential recruits, without proper knowledge, may tend to experiment or misuse these dangerous drugs. These can have long-term, adverse effects on the individual and on his performance in the Navy if such individuals were to enter the Naval Service months, and even years after taking certain drugs.

Another movie "Reef Points in Personnel Effectiveness" (MN–10089) was produced in 1965 with financial assistance for the script from the Bureau of Naval Personnel. This movie stresses personnel reliability, leadership at all levels and surveillance of personnel to detect the potentially unreliable, emotionally disturbed or ineffective individual. It emphasizes the psychological factors involved, provides guide-lines for recognition of possible developing instability or unreliability, and suggests steps to be taken in management of such instances. This movie has been reemphasized as a companion movie to the drug movies, "LSD" and "Trip to Where." It thus additionally can serve in possible detection of any serviceman who might be misusing these dangerous drugs. This, as a result, can serve to increase the operational effectiveness of the Navy.

The other NP movies can be of similar, though less direct, effect on these problems involving personnel and their emotional reactions or personality types which can either temporarily or permanently adversely affect the performance, reliability, and effectiveness of the individual and, in turn, the Navy. These films include:

(a) "Journey to the Bottom"—on depression (MN–9778e);

(b) "It's a Plot"—on the paranoid person (MN–9778c) (Winner of a Film Award from the Association of Military Surgeon.);

(c) "The Man Nobody Likes"—on the passive-aggressive personality (MN–9778);

(d) "The Man-Child"—on the emotionally immature or unstable personality (MN–9778b);

(e) "Troubled Seas"—on out-patient treatment and preventive psychiatry (MN–9716); and,

(f) "Preventive Psychiatry—In or Out"—on recruit screening (MN–9479).

It is recommended that all of these films be made available and utilized throughout the Naval Establishment. This has already been accomplished for "LSD" and "Trip To Where."—Bureau of Medicine and Surgery.

FACILITIES FOR SELECTIVE CORONARY CINEANGIOGRAMS BY THE SONES TECHNIQUE

A completely new cardiac catheterization laboratory, one of the most modern and versatile in this country, has been installed at Naval Hospital, Bethesda. One of the major design features of this new diagnostic laboratory is a six-inch image amplifier coupled with 35 mm cine recording equipment, a combination which affords facilities for obtaining the most refined selective coronary angiographic studies. Often in the past inconclusive diagnostic studies have handicapped the clinician dealing with patients having atypical chest pain or nonspecifically abnormal electrocardiograms. The availability of precise coronary angiographic studies will be invaluable in these select instances where the presence or absence of coronary artery disease cannot be proved by the usual means.—Naval Hospital, NNMC, Bethesda, Md.

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